

**Factors Affecting the Usability of Educational Portals and their Influence on
the Information Practices of Pre-Collegiate Educators**

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The goal of this dissertation is to develop a model that benefits educators and instructional technologists in building effective educational portals that meet teachers' specific needs when they seek information in support of teaching preparation. This study consists of a Factor Study and an Acceptance Study to understand K-12 teachers' information behavior. It has two supporting theories – Task Complexity (Byström & Järvelin, 1995) and Technology Acceptance Model (TAM; Davis, 1993) – to evaluate what factors influences K-12 teachers' information-seeking behavior and their acceptance of educational portals in relation to tasks associated with lesson preparation. Also, the study used a mixed-method approach to address the research questions and included East Asia Gateway for Linking Educators (EAGLE) and four other portals as platforms to accurately cross-check K-12 teachers' acceptance. EAGLE (<http://noborders.ucis.pitt.edu/eagle/>) is an educational portal that provides East Asia resources for teaching and created by the National Consortium for Teaching about Asia (NCTA) at the University of Pittsburgh. All the participants are NCTA alumni who have an account on EAGLE.

The main findings of this study are: (1) Teachers' background, prior technological experiences, extrinsic barriers, intrinsic barriers and attitudes influence information-seeking behavior and their acceptance and usage of educational portals. More specifically, an individual's attitude is a major factor impacting teachers' seeking information from educational portals to be incorporated into course design. (2) K-12 teachers' Perceived Usefulness is an

important factor that influences their acceptance of educational portals; however, when K-12 teachers actually use portals, their Perceived Ease of Use becomes a more important factor. (3) The main factors that influence K-12 teachers' acceptance of educational portal are: Time Issues and System Interface. (4) Teacher's Computer Self-efficacy (TCS) is a catalyst that changes K-12 teachers' information behavior when using educational portals.

The limitations of this study were, first, the participants were volunteers and limited to a small geographic area (Pittsburgh) and emphasized social sciences teachers. Additionally, the data was collected from self-reported measures and not by independently verified instruments. Both of these aspects could limit the generalizability of this study.

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1.0 INTRODUCTION

Computer and internet technologies are now widespread, which directly impacts teaching and learning in K-12 education. Teachers' integration of technologies into classes has been the topic of a significant amount of research in the past decades (Afshari, Bakar, Luan, Samah, & Fooi, 2009; Buabeng-Andoh, 2012; Dwyer, Ringstaff, & Haymore, 1990; Ertmer, Ottenbreit-Leftwich, Sadik, & Sendurur, 2012; Russell, Bebell, O'Dwyer, & O'Connor, 2003). Given the prevalence of diverse technologies, teachers have become very aware of the possibility of using various kinds of computer and internet-based technologies to enhance their teaching and learning processes (Hew & Brush, 2007). In relation to Information Communication Technology (ICT), the number of web-based portals that support school education has been steadily growing (Butcher, 2002). More specifically, educational portals are resource gateways that support access to specific area content knowledge for teachers (Butcher, 2002; Pynoo, Tondeur, van Braak, Duyck, et al., 2012). As Kaur and Baba (2006) pointed out, educational portals "unify content and service into one area for people to access on the WWW (World Wide Web)" (p1).

This dissertation uses educational portals as information resource platforms to explore pre-collegiate educators' information seeking behavior and attitudes toward web-based portals. It first investigates the factors of pre-collegiate educators' information-seeking behavior in relation to tasks associated with lesson preparation and then explores what influences educators' acceptance of educational portals. In this dissertation, "pre-collegiate educators" are referred to

as K-12 teachers when the focus is on lesson preparation activities for grades K-12, even though no participants were currently middle school teachers. The principals and librarians, who participated in this study, were instructed to focus on their responsibilities as teachers rather than educational staff. The goal of this dissertation is to develop a model that benefits educators and instructional technologists when building effective educational portals that meet teachers' specific needs when seeking information in support of lesson preparation. This dissertation focuses on several aspects of teachers' personal background, cognitive activity, emotions, feedback from information environments to discover the main factors that influence the pre-collegiate educators' information practices.

Chapter 1 includes (1.1) the background and problem statement, (1.2) the purpose of the study, (1.3) research design, (1.4) limitations, (1.5) terminology, and (1.6) operational definition. The remainder of the study consists of Chapter 2 literature review, Chapter 3 research method, and Chapter 4 the findings and discussions of the Factor Study, Chapter 5 the findings and discussions of the Acceptance Study, and Chapter 6 conclusion and future study.

1.1 BACKGROUND AND PROBLEM STATEMENT

The integration of technology has changed education in the Information Age. Many previous studies have focused on how teachers teach with technology (Dwyer et al., 1994; Hooper & Rieber, 1995); what factors influence teachers' integration of technology in the classroom (Afshari et al. 2009; Ertmer & Ottenbreit-Leftwich, 2010; Usun, 2009); and how ICT influences educational practices (Buabeng-Andoh, 2012; Fu, 2013). Nevertheless, the background and

problem statement of this chapter start with exploring what factors influence teachers' adoption of technology, teachers' information-seeking behavior, and teachers' acceptance of technology, specifically ICT. This section's four parts are the factors that influence: teachers' adoption of technology, general users' information-seeking behavior and models, K-12 teachers' information-seeking behavior and models, and teachers' acceptance of technology.

1.1.1 Factors that Influence Teachers' Adoption of Technology

Computer and Internet technologies are diverse and complex, which makes teaching with technology overwhelmingly challenging for teachers (Koehler & Mishra, 2008). As reported by the National Center for Education Statistics [NCES] (2006), most K-12 teachers understand that technology now plays a significant role in developing instructional materials, and more than 99 percent of U.S. K-12 schools provide professional development training courses to teachers to assist them to integrate web technology into their curricula. However, only “one-third of the teachers reported feeling well or very well prepared to use computers and the Internet for instruction” (National Center for Education Statistics [NCES], 2006) .

Many studies stated that a teacher's personal characteristics and context influence his/her decision in adopting computers and ICT into the classroom (Afshari et al., 2009; Balanskat, Blamire, & Kefala, 2006; Buabeng-Andoh, 2012; Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Koehler & Mishra, 2005; Usun, 2009). More specifically, ICT has extended traditional teaching practices (Schiller, 2003). For example, Afshari et al. (2009) indicated that teachers' non-manipulative (demographic) factors (e.g. gender, age, individual educational level, and prior technological experience) and manipulative factors (e.g. teachers' attitudes, ICT knowledge and

skill, and the commitment level of the school towards implementation of ICT) affect teachers' decisions regarding the use of ICT in their teaching and learning processes. Likewise, Buabeng-Andoh (2012) pointed out that these factors (e.g. age, gender, educational level, educational experience, computer experience, teachers' attitudes, ICT competence, and computer self-efficacy) will affect teachers' adoption of new technologies.

The use of ICT requires teachers to enhance their knowledge and change their attitudes in order to reduce the challenges when integrating new technologies into the classroom, which can lead to some hesitancy (Davies, 2011; Schiller, 2003). For example, Ertmer and Ottenbreit-Leftwich (2010) indicated that teachers' knowledge (content knowledge, pedagogical knowledge, and technological knowledge) are the key variables that influence teachers' decisions – whether to integrate technology into the classroom or not. Similarly, Koehler & Mishra (2005) indicated that teachers' knowledge is a complex web of the relationships among these knowledge elements, which has significant implications for the teachers' teaching-learning process and professional development.

Teachers' attitudes toward technology have a major influence on their decisions of whether or not to integrate technology into their classrooms (Albirini, 2006; Banas, 2010; Bullock, 2004; Fu, 2013; Mumtaz, 2000; Sadik, 2006; Sahin-Kizil, 2011; Yüksel & Kavanoz, 2011). As Bullock (2004) pointed out, teachers' past positive/negative experiences in using technology will affect their attitudes towards having technology in the classrooms. Similarly, Albirini (2006) and Mumtaz, (2000) stated that teachers with positive attitudes preferred to integrate ICT into their pedagogy and were more successful in applying ICT in the classroom than those teachers with negative attitudes towards ICT. In other words, teachers with negative attitudes towards technology will delay the use of new technology (Banas, 2010; Sadik, 2006).

The literature also demonstrated that teachers who have negative attitudes towards the integration of technology have more barriers and are less confident in using technology in their classrooms. For example, Ertmer (1999) identified teachers' extrinsic barriers and intrinsic barriers as the two main types of barriers that influence teachers integrating technologies into instructional practices. Balanskat et al., (2006) also indicated that the barriers teachers have encountered can impede their successful implementation of ICT in teaching. More specifically, the barriers that teachers have encountered when incorporating technology into the classrooms were grouped into three levels — teachers' level, school-level, and system-level (Balanskat et al., 2006; Jones, 2004).

In summary, there are many personal and contextual factors that encourage/discourage teachers' integration of technology into their teaching and learning processes. Taken together, they offer a wealth of reasons as to why teachers' adoption of ICT into their instructional practices has been limited.

1.1.2 Models of General Users' Information-Seeking Behavior

“People seek out and use information constantly as part of their daily life” (Dinet, Chevalier, & Tricot, 2012). As Marchionini (1997) stated, information seeking is “a natural and necessary mechanism of human existence” (p5), and also individuals' information seeking becomes a fundamental behavioral process when people seek information by means of electronic technology. What is information-seeking behavior? Many definitions of information-seeking behavior exist. Byström and Järvelin (1995) stated “a person's information seeking depends on her tasks and the problems encountered in performing them”. Allen (1996) pointed out

“information seeking is the behavior that is the directly observable evidence of information needs and the only basis upon which to judge both the nature of the need and its satisfaction” (p56). Marchionini (1997) stated “information seeking is a fundamental human process closely related to learning and problem solving” (p5). Wilson (2000) indicated that “the purposive seeking for information [is]... a consequence of a need to satisfy some goal” (p49). So, an individual’s information-seeking behavior begins when a person perceives a gap in his/her existing knowledge, and his/her information need occurs when individual knowledge gaps happened (Allen,1996; Johnson et al, 1995).

Many scholars have proposed models of information-seeking behavior over the last decade (in roughly chronological order): Wilson’s (1981 and 1996) model of information seeking behavior; Bandura (1982) social cognitive theory; Dervin’s (1983) Sense-Making theory; Ellis’s (1989 and 1993) behavioral model of information seeking strategies; the Big6 proposed by Mike Eisenberg and Bob Berkowitz in 1990 (Lowe & Eisenberg, 2005); Kuhlthau’s (1991) model of the information-seeking process (ISP); Byström & Järvelin's (1995) information seeking model of task complexity; and Johnson’s (1995) Comprehensive model of Information seeking (CMIS); and Leckie's (1996) general model of the information seeking of professionals. However, most of the models study general users’ information seeking, searching and retrieval behaviors; only a few studies have focused on teaching-learning or professional workers’ information-seeking behavior.

1.1.3 Models of K-12 Teachers' Information-Seeking Behavior

Different professional groups have their own information-seeking behaviors and information needs (Tahir et al., 2008). Likewise, Joshi & Nikose (2010) indicated “Information-seeking behavior differs among user groups” (p2). In educational settings, the major reasons for teachers using computer technology are to prepare instructional materials and to look for information in a particular subject area (Chiero,1997). This role has increased and developed by two strong trends in ICT: “the powerful development of new information and communication technologies” and “an increasingly student-centered and problem-based pedagogical orientation” (Limberg and Sundin, 2006).

Teachers' integration of technology is not a new topic, but “information-seeking and learning in educational settings have not been explored to a great extent” (Limberg & Sundin 2006). There are four models that closely relate information-seeking processes and problem-solving for academics and professionals: the Big6 (Lowe & Eisenberg, 2005), Kuhlthau's ISP (Kuhlthau, 2005), and Leckie's professional information seeking (Leckie, 1996), and Task Complexity (Byström & Järvelin, 1995) .

The Big6 is an information process model that initially focused on the teaching-and-learning area (Lowe & Eisenberg, 2005). The Big6 was originally developed by Eisenberg and Berkowitz to understand different age group students' information problem-solving activities, particularly to guide students seeking information in the library. The purpose of the Big6 is to describe a process of problem-solving to be applied whenever people need and use information. It includes six stages – Task definition (e.g. define the problem), information seeking strategies (e.g. determine all possible resources and select the best sources), location and access (e.g.

locate sources), use of information (engaging and extracting relevant information), synthesis (organize the information from multiple sources and present it), and evaluation (judge the effectiveness and efficiency of the results) (Lowe & Eisenberg, 2005).

Kuhlthau's Information Search Process (Kuhlthau, 2005) finds personal affective dimensions in task processes and was originally developed by Kuhlthau to study secondary school students' information search processes. Kuhlthau's ISP, now, is one of theories that is used to understand how information workers approach information seeking tasks. It is concerned with users' information seeking processes in three domains: feelings, thoughts, and actions (related to physical activity at the different stages) in the information search process; and the interplay of these with additional seven stages (including initiation, selection, exploration, formulation, collection, presentation, and assessment) (Dinet et al., 2012).

Leckie's (1996) theory examines various fields of professionals' information-seeking behavior and information use including librarians, academics, researchers, doctors, nurses and many others. This professionals' information-seeking model focuses on studying "what information practices are embedded within professional work, how these information related practices function to contribute to the work, and whether or not these practices can be improved or changed for the better" (p159).

However, the three models of information-seeking behavior discussed above focus on examining personal affective dimensions of the information searching process and/or information problem-solving. Nevertheless, K-12 teachers' information-seeking behavior is more complex because it depends on individual teachers' teaching needs for lesson preparation (Tahir et al., 2008). Thus, to figure out what personal and contextual factors influence K-12 teachers' information-seeking behavior when they seek information for lesson preparation through

educational portals, the first study of this dissertation used the Information Seeking model – Task Complexity (Byström & Järvelin, 1995) – to examine K-12 teachers’ information needs and information seeking activities. The literature demonstrates that the Task Complexity model considers different personal and contextual factors of teachers as the most important factors influencing teachers’ integration of information technology into their instruction (Buabeng-Andoh, 2012; Fu, 2013; Pelgrum, 2001). As Wang (2011) has indicated, this model has successfully examined professional workers’ information needs and information-seeking when they perform their work tasks.

1.1.4 Teachers’ Technology Acceptance

Although technology-supported teaching/learning has become more widespread during the information age, adoption and use of newer technology has become a critical challenge among educators, teachers, and school administrators (Hu, Clark, & Ma, 2003). Also, “the teacher is the key to effective use of technology in the educational system” (Teo, 2009). Thus, to investigate K-12 teachers’ willingness to use (or not to use) and the acceptance of educational portals as information resources, it is necessary to understand teachers’ information usage behavior. Understanding teachers’ information usage behavior will assist information technologists when they construct educational portals. As Agarwal (2000) and Pynoo et al. (2011) pointed out, individual acceptance of information technology is a key issue when a person makes a decision to use or not to use it. An information system’s viability depends on whether an individual’s adoption reflects continuous use or not (Thong, Hong, and Tam, 2006).

There are many reasons for choosing the Technology Acceptance Model (TAM) as the basic model in the Acceptance Study. First, TAM was proposed by Davis in 1989 and has been confirmed as a reliable and valid way to study human behavior when using information systems (Davis & Venkatesh, 1996). Second, TAM is a flexible model that allows researchers to merge it with psychological theories and/or other variables in order to investigate an individual's behavior across computing technologies (Davis, 1989 and 1993; Legris, Ingham, & Collerette, 2003; Robey, 1979; Venkatesh, Morris, Davis, & Davis, 2003; Yayla & Hu, 2007). Many studies have integrated TAM with individuals' computer self-efficacy to examine one's behavior in a specific environment (Agarwal, 2000; Bandura, 1982; Davis and Venkatesh, 1996; Wagner, Hassanein, & Head, 2010 ; Zhang, Fang, Wei, & Wang, 2012). As Davis and Venkatesh (1996) pointed out, TAM links users' and system characteristics via perceived usefulness and perceived ease of use to help researchers to understand peoples' attitudes towards information systems.

In education settings, TAM has been an important model for many studies. As Smarkola indicated, TAM has been used to investigate these issues in education: “a) student acceptance of online courses, b) course websites as effective learning tools, c) online student communication for a class project, d) e-learning (e.g., WebCT) in undergraduate courses, e) gender differences in pre-service teachers, and f) student teachers' perception of computer technology in relationship to their intention to use computers”(Smarkola, 2011, p. 11) .

Teachers are willing to integrate technology into their classrooms when they believe technology will help them accomplish their professional tasks and/or be more efficient in their teaching (Ertmer & Ottenbreit-Leftwich, 2010). As Albion (1999) stated, teachers' computer self-efficacy can be a significant factor in influencing teachers' decision making on whether to use or not to use computer technology in their instructional planning and class practices.

Likewise, Paraskeva et al. (2008) show that teachers' computer self-efficacy "determine to a considerable extent the ability to develop such technologies as an important educational tool" (p. 1085). Thus, to understand teachers' computer self-efficacy is an important aspect to be studied as to whether it influences teachers' decisions making on using or not using educational portals to prepare their instruction and class materials.

In recent decades, many researchers have extended TAM with psychological theories, particularly self-efficacy by Bandura (1977), and external variables as dependent variables to get a better understanding of teachers' acceptance and intention toward technology (Gong & Xu, 2004; Gong & Xu, 2004; Hu et al., 2003; and Teo, 2009). For example, Gong & Xu, (2004) used TAM and added "computer self-efficacy as a direct antecedence of perceived ease of use and intention to use" (p. 367) to understand teachers' technology acceptance of a web-based learning system. Hu et al. (2003) used TAM to understand school teachers' acceptance of technology, PowerPoint, and then to examine whether technology can enhance teaching and learning in K-12 education by measuring the following variables: job relevance, compatibility, computer self-efficacy, subject norm, perceived ease of use, perceived usefulness, and intention to use. Teo (2009) used a TAM based model and considered with Computer Self-Efficacy to study teachers' behavioral intention to use computer technology which examined perceived usefulness, perceived ease of use, subjective norm, facilitating conditions, and attitude towards use.

However, few studies have used both quantitative and qualitative approaches, merging TAM with teachers' computer self-efficacy (TCS) and other variables, in order to measure what characteristics are most influential when K-12 teachers accept a specific educational portal as an information resource to help them in their lesson preparation.

1.2 THE PURPOSE OF THE STUDY

In evaluating the previous studies, one must be aware that little attention has been paid to understand what characteristics encourage/discourage teachers' information-seeking behavior and influence K-12 teachers' acceptance of educational portals as information resources to support their lesson preparation. Thus, this dissertation explores what influences K-12 teachers' information behavior (i.e. information-seeking behavior and acceptance) when using educational portals as information resources. The purpose of this dissertation is to develop a model that benefits educators and instructional technologists in building effective educational portals that meets teachers' specific needs when they seek information on an ICT to support their lesson preparation.

1.3 RESEARCH DESIGN

Figure 1 shows the conceptual framework of the dissertation. It explores what factors (red rectangle) influence teachers' information-seeking behavior (purple rectangle) and how teachers' information behavior influences usage of educational portals (green rectangle). Additionally, it explores which of those factors (red rectangle, via the Factor Study) influence teachers' acceptance of educational portals (orange rectangle), which is also influenced by their information-seeking behavior (purple rectangle) and then influences their actual portal usage (green rectangle).

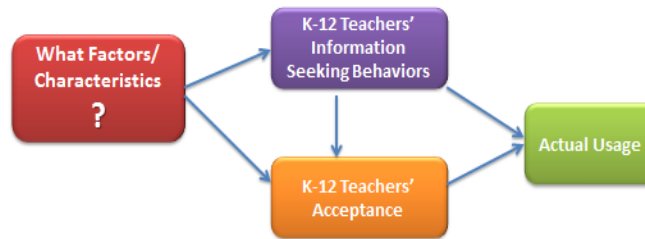


Figure 1. The Conceptual Framework of the Dissertation

Based on Figure 1 (above), Figure 2 shows the detail research design of this dissertation which includes a Factor Study and an Acceptance Study based on two theories respectively – Task Complexity in Information Seeking (Byström & Järvelin, 1995) and Technology Acceptance Model (TAM) (Davis, 1989). The gray boxes in Figure 2 indicate the Factor Study (the first study) that explores the relationship between K-12 teachers' information-seeking behavior and the six factors (listed in the Figure 2) when teachers incorporate materials/resources from educational portals in their lesson preparation. The blue boxes in Figure 2 belong to the Acceptance Study (the second study) that is about teachers' attitude towards using educational portals as information resources for their lesson preparation.

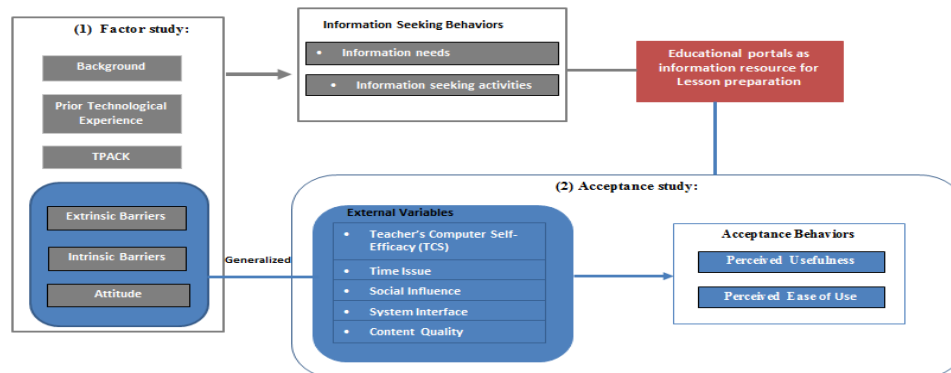


Figure 2. The Concept of Two Studies in the Dissertation

These two studies aim to answer the following two main research questions:

RQ1: Which factors critically influence K-12 teachers' information-seeking behavior when teachers seek information from educational portals to be incorporated into course design? The six factors evaluated here are Background, Prior Technological Experiences, TPACK, Extrinsic Barriers, Intrinsic Barriers, and Attitudes.

RQ2: What variables influence K-12 teachers' acceptance of educational portals as the information resources for their lesson preparation? The five variables considered here are Teachers' Computer Self-efficacy, Time Issues, Social Influences, System Interface, and Content Quality.

1.3.1 The First Study – Factor Study

The first study, referred to as the Factor Study, focuses on exploring what K-12 teachers' personal and contextual factors influence their information needs and information-seeking activities. I used the information seeking model, Task Complexity, to examine K-12 teachers' information-seeking behavior because this model is concerned with professional workers' information needs and information-seeking in the successful performance of their work tasks. Thus, the Factor Study examines the relationship among the six important factors of K-12 teachers; teachers' information needs and teachers' information-seeking activities when they incorporate educational portals as information resources into lesson preparation. The six important factors are (1) Background (including demographic, educational, and teaching background), (2) Prior Technological Experiences, (3) Technological Pedagogical Content Knowledge (TPACK), (4) Extrinsic Barriers (e.g. access, interface, time-consumption, and user

support), (5) Intrinsic Barriers (e.g. beliefs and confidence), and (6) Attitudes (e.g. intention, personal preference, and comfort level).

1.3.2 The Second Study – Acceptance Study

The second study, referred to as the Acceptance Study, focuses on finding what characteristics influence K-12 teachers' acceptance of educational portals as information resources for their lesson preparation. Based on my Factor Study and other teachers' technology acceptance studies, I used Davis' Technology Acceptance Model (TAM) as a basic model to link teachers' characteristics to investigate what causes K-12 teachers to accept or reject educational portals via their Perceived Usefulness and Perceived Ease of Use. In other words, the Acceptance Study examines what characteristics influence teachers' decision of using educational portals for lesson preparation. These characteristics are related to K-12 teachers' personal feelings (i.e. enjoyment, comfort level, self-confidence), information environments (i.e. system interface), and real-world conditions as variables to help understanding teachers' acceptance of educational portals. The five variables are: Teachers' Computer Self-efficacy (TCS), Time Issues, Social Influences, System Interface, and Content Quality, which were identified in the Factor study as principle factors.

1.4 LIMITATIONS

This study attempted to scrutinize teachers' information seeking behaviors, acceptance and actual usage of educational portals as information resources for lesson preparation in order to create a better model of K-12 teachers' information behaviors. This dissertation has a few limitations that will be discussed in this section.

A limitation is related to the participants recruited. The participants sampled are from the local areas surrounding Pittsburgh, and do not include teachers from the larger national NCTA training sites. Also, the participants are not from diverse backgrounds since most are teachers who are interested in incorporating East Asia content into their teaching and are social science instructors. Future studies can extend sampling of participants from various academic fields to understand teachers' information seeking behaviors in other areas as well, for example, extending the study to include other cultural heritage topics.

A limitation relates to the teachers' factors examined in the study. The literature demonstrated that many different personal characteristics and contextual factors may be influential. Although this dissertation attempted to cover most of the prominent factors, there are other factors that may possibly affect K-12 teachers' technology adoption and integration that were not included in this study.

A limitation is related to the data collected on teachers' self-reported knowledge and computer self-efficacy; although this study provided a mixed-method way to cross check the results. The self-reported method may generate biased data because teachers could over- or under-estimate themselves. It would be better to have a way to objectively measure teachers' knowledge and computer competence.

An additional limitation relates to data collected through interviews with teachers. Teachers volunteered (self-selected) to join the interview, which limited the different levels (e.g. lower-, middle- or high- levels of computer skills) of teachers in the Acceptance Study. Most of the teachers interviewed have a self-reported high level of technology integration which influences the information seeking behaviors and acceptance attitudes observed in this study.

1.5 TERMINOLOGY

The following section defines terms used in this dissertation in alphabetical order.

- **EAGLE (East Asia Gateway for Linking Educator) :**

An educational portal created and provided by the National Consortium for Teaching about Asia (NCTA) at the University of Pittsburgh. The purpose of the National Consortium for Teaching about Asia (NCTA) is to encourage and facilitate teachers to use high quality East Asia resources in their K-12 curriculum (<http://www.nctasia.org/>)

- **Educational Portals:**

“The basic definition of education portals is that it refers to portals that provide educational services to their users” (Kaur & Baba, 2006, p. 1). EAGLE, Asia for Educators, American Memory, The Pennsylvania Standards Aligned System, and History World are the educational portals used in this dissertation.

- **Extrinsic Barriers:**

Extrinsic barriers were proposed by Ertmer (1999) “... barriers to technology integration are described as being extrinsic to teachers and include lack of access to computers and

software, insufficient time to plan instruction, and inadequate technical and administrative support” (p. 48).

- **Information Seeking Behavior:**

The concept of information seeking behavior is the combination of information needs and information seeking activities.

- **Intrinsic Barriers:**

Intrinsic barriers were proposed by Ertmer (1999) “... barriers are intrinsic to teachers and include beliefs about teaching, beliefs about computers, established classroom practices, and unwillingness to change” (p. 48).

- **NCTA (National Consortium for Teaching about Asia):**

NCTA is a nationwide program funded by the Freeman Foundation, launched in 1998. It is a collaboration of the East Asian Studies programs of seven national institutions -- Columbia University, Five College Center for East Asian Studies at Smith College, Indiana University, the University of Colorado, the University of Pittsburgh, the University of Southern California, and the University of Washington. The purpose of the National Consortium for Teaching about Asia (NCTA) is a premier provider of valuable resources for the professional development of K-12 teachers interested in including materials into their classroom about modern and historical East Asia

- **Self-Efficacy :**

According to Bandura (1977), self-efficacy refers to the “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3).

It has four sources: (1) mastery experience (a person’s previous success and/or failure experiences), (2) vicarious experience (a person observation of others’ successes and/or

failures), (3) verbal persuasion/social persuasion (a person has been persuaded by peers, colleagues, or others), and (4) affective arousal/emotional state (a person's emotional states such as anxiety, stress, arousal, and mood states).

- **Subjective Norms:**

“... a person's perception that most people who are important to him think he should or should not perform the behavior in question” is Fishbein and Ajzen's (1975, p. 302) definition Subjective Norms.

- **Task Complexity in the Information Seeking Model:**

According to Byström & Järvelin (1995), “task complexity is structured as a feedback loop” (Case, 2008, p. 129), and it begins with the task as perceived by the user combined with personal factors (e.g. the factors of professional workers' education level, prior experience, attitudes, motivation, and mood), and situational factors (e.g. Time available). Also, these factors affect how the users' determine their information needs and information seeking style on information channels and sources to satisfy those needs (Case, 2008).

- **Teachers' Computer Self-efficacy (TCS):**

Teachers' Computer Self-efficacy (TCS) is based on self-efficacy from Bandura (1994) to broadly understand teachers beliefs/confidence about themselves as users of information technology. It uses Compeau and Higgins' computer self-efficacy (1995) to evaluate self-efficacy in three dimensions: (1) Teachers' Computer Self-efficacy Strength (TCSS) – whether teachers feel confident to perform various tasks or, inversely, feel anxiety, stress, etc. about performing technological tasks; (2) Teachers' Computer Self-efficacy Generalizability (TCSG) – whether teachers have abilities in different domains

of computer technology and/or willingness to use new systems ; and (3) Teachers' Computer Self-efficacy Magnitude (TCSM) – whether teachers feel capable of accomplishing difficult computer tasks.

- **Technology Acceptance Model (TAM):**

Technology Acceptance Model (TAM), originally proposed by Davis in 1989, introduces two very important variables: (1) perceived usefulness, defined as the extent to which a person believes that using the system will enhance one's job performance; and (2) perceived ease of use, defined as the extent to which a person believes that using the system is effort-free (worth the effort) (Agarwal, 2000; Davis, 1989). The concept of acceptance of educational portals is based on these two characteristics.

- **Technological, Pedagogical and Content Knowledge (TPACK):**

TPACK was created by Mishra & Koehler (2006) based on Shulman's (1986, as referenced in Mishra & Koehler, 2006) idea of pedagogical content knowledge (PCK) in order to consider teachers' technological knowledge and skills to meet their needs when they integrate technology into instruction in specific content areas. It is also referred to as TCPK in the literature.

1.6 OPERATIONAL DEFINITIONS

This section serves as a summary reference of the major variables used in this dissertation, their type (categorical or numeric), their origin (in the various surveys/interviews used in this

dissertation), and where they are used. Each variable is further defined in the section of the dissertation where it is introduced. Variables are listed in alphabetical order.

- **Acceptance (of educational portals):** this is conceptual variable made up from Perceived Usefulness and Perceived Ease of Use.
- **Actual Usage:** a Content Analysis categorical variable (0/1/2) created during the analysis of the first interview of the Acceptance Study. If the participants characterized their usage of educational portals, in Q7 and Q10, as ‘rarely use’, it was marked as 0; if they characterized their usage as ‘frequently’ it was marked as 2, and ‘1’ was used for a ‘it depends’ type of response.
- **Attitude:** a continuous variable created by performing a factor analysis on the responses to questions 20, 21, and 22 from the Factor Study Survey. Its three components are 1) enjoyment of using educational portals, 2) comfort level in using them, and 3) intention to use resources from educational portals in lesson preparation.
- **Content Quality:** a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned terms related to ‘Relevant Content/resources’, ‘Content sharing capability’, and/or ‘Content reliability’, it was marked as 1, else 0.
- **Extrinsic Barriers:** a count variable (0-9) created by summing the number of positive responses to Question 24 in the Factor Study Survey. It is used in the Factor Study’s bivariate analysis to measure barriers external to the individual teachers. For example, ‘Not easy to use’, ‘Lacks esthetic design’, ‘Not well-organized’ are each possible categories, among others, to be checked in Question 24.

- **Information Needs:** a continuous variable created by performing a factor analysis on the responses to Question 23 of the Factor Study Survey. It identifies the extent to which participants used educational portals to support their lesson preparation. For example, “To develop curriculum”, “To extend existing curriculum”, “To look up new information” are among the possible responses to question 23.
- **Information Seeking Activities:** a continuous variable created by performing a factor analysis on the responses to question 15 of the Factor Study Survey. This question is composed of 6 sub-questions using a 5 point Likert Scale. It includes “Browsing resources, curricula, or images”, “Searching, retrieving resources, curricula, or images”, and “Deriving resources, curricula, or images” as some of the sub-questions to which the frequency of these activities is measured on the Likert scale.
- **Intrinsic Barriers:** a count variable (0-9) created by summing the number of positive responses to Question 25 on the Factory Study Survey. It is used in the Factory study to measure barriers internal to the individual teachers. For example, ‘Don’t know to incorporate resources into your own curriculum.’, “Don’t believe the existing resources can enhance or enrich the teaching process”, “Lack confidence in the content of educational portals” are each possible categories to be checked in Question 25.
- **Perceived Ease of Use:** two measures of Perceived Ease of Use are used in this dissertation. The first is the sum of the responses based on a 4 point Likert scale to Question 14 of the Acceptance Study: Acceptance Survey. It is used in the descriptive statistics section of the analysis of the Acceptance Study. The second is a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned terms related to ‘learning to use

educational portals for teachers is easy', 'It is easy to recover from errors encountered while using educational portals for teachers', or 'Interacting with educational portals for teachers does not require much effort' or terms related to any of the other 2 sub-items from question 14, it was marked as 1, else 0.

- **Perceived Usefulness:** two measures of Perceived Usefulness are used in this dissertation. The first is the sum of the responses based on a 4 point Likert scale to Question 13 of the Acceptance Study: Acceptance Survey. It is used in the descriptive statistics section of the analysis of the Acceptance Study. The second is a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned terms related to 'addresses my teaching related needs', 'supported critical aspects of my teaching', or 'enabled me to accomplish my curriculum design more quickly' or terms related to any of the other 5 sub-items from question 13, it was marked as 1, else 0.
- **Prior Technological Experience:** a combination variable created by response to questions 11, 13, and 14 in the Factor Study Survey. Its three components are 1) Integrating technology into curriculum, 2) experience with online search engines and 3) usage of educational portals.
- **Social Influences:** a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned terms related to 'Subject Norms', 'Curriculum setting', or 'School technology support', it was marked as 1, else 0.
- **System Interface:** a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned

terms related to the system interface such as ‘Grouping/Highlighting of information’, ‘Screen standardization’, or ‘Navigability’, it was marked as 1, else 0.

- **Teachers’ Computer Self-Efficacy:** a Content Analysis categorical variable (0/1) created during the analysis of the Acceptance Study: Acceptance Interview. If the participants mentioned ‘belief’ or ‘confidence’ in using computer hardware, software, and/or educational portals, it was marked as 1, else 0. In the Acceptance Study - 2: Self-efficacy Interview, there are a series of questions to focus on each of these three dimensions: Strength, Magnitude, and Generalizability. TCSS (Strength) is associated with questions 1 to 7, TCSM (Magnitude) is associated with questions 8 to 11 (part 2 of questions 8 and 9), and TCSG (Generalizability) is associated with questions 8 to 10 (part 1 of questions 8 and 9): all are categorical variables (0/1) created during the Content Analysis of the Acceptance Study: Self-efficacy Interview. Each of these three dimensions is also then coded as four sub-categorical variables based on Bandura’s self-efficacy sources of 1) Mastery experiences, 2) Vicarious experiences, 3) Social persuasion, and 4) Affective arousal. If the participants associate any of the four sources with one of the three self-efficacy categories, that category’s value for that source is marked as 1, else it is a 0.
- **Time Issues:** a Content Analysis categorical variable (0/1) created during the analysis of the first interview of the Acceptance Study. If the participants mentioned time constraints or time consumption, time issues were marked with a 1 otherwise 0.
- **TPACK:** a continuous variable created by performing a factor analysis on the responses to questions 12, 16, and 17 which are 5 point Likert scale questions. It includes technological knowledge, content knowledge, and pedagogical knowledge.

2.0 LITERATURE REVIEW

Chapter 2 presents a review of the literature that is relevant to this dissertation in four sections. The first section (2.1) is the theoretical framework which describes the two information seeking behavior theories that are related to this study. The second section (2.2) is an overview of teachers' integration of technology, particularly the use of ICT. The third section (2.3) is the literature review of the factors discussed in this study that may affect K-12 teachers' integration of information technology. The fourth section (2.4) is the literature review of relevant research methods that includes a brief introduction of the mixed-method and content analysis.

2.1 THEORETICAL FRAMEWORK

Information seeking behavior is the topic of many studies and has been defined in many different manners (e.g. in roughly chronological order: Wilson, 1981 & 1996; Bandura, 1982; Dervin, 1983; Ellis, 1989; Mike Eisenberg and Bob Berkowitz, 1990; Kuhlthau, 1991; Byström & Järvelin, 1995; and Leckie, 1996). The literature also demonstrates that information-seeking behavior has gradually become a significant aspect of our professional lives. Tahir et al. (2008) stated that “understanding of user information needs and information-seeking behavior is fundamental to the provision of successful information services” (p. 1).

This dissertation recommends two models – task complexity in information seeking and a technology acceptance model (TAM) merged with teachers’ computer self-efficacy (TCS) into two studies to understand what factors affect or support teachers’ information seeking behavior and attitudes towards using web-based environments, particularly, in educational portals.

2.1.1 Information Seeking Model – Task Complexity

The Factor Study (the first study) explores what factors of K-12 teachers’ personal and contextual environment affect their information needs and information seeking activities when seeking information on the web-environment to support their teaching preparation. As Case (2008) pointed out, task complexity is “a useful way of thinking about the way in which information users operate” (Case, 2008, p. 129). Task Complexity as a model was proposed by Byström & Järvelin (1995); and the Task Complexity model frames information needs and information seeking in the context of professional work (Wang, 2011).

Byström & Järvelin (1995) also pointed out “a person’s information seeking depends on his or her tasks and the problems encountered in performing them” (p. 191). So, this model begins with a task, considers users’ personal and situational factors, interprets the information need as a gap between the users’ knowledge and the task, and views information-seeking style as an activity that can complete the task requirements.

Figure 3 shows the concept of Task Complexity; and it is represented as a “feedback loop”. Task Complexity is a model that considers the professional workers’ viewpoints and their cognitive domain to determine what information is needed and what actions can satisfy their needs.

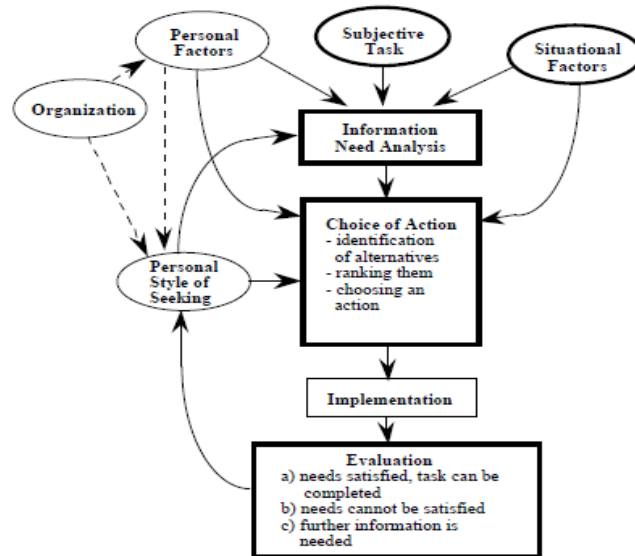


Figure 3. Information Seeking Model – Task Complexity (Byström & Järvelin,1995,p. 9)

Figure 3 also shows that Task Complexity is a concept used to study user' information seeking behaviors through various types of information channels; and this model not only considers the workers' job type, their cognitive domain to determine what information is needed, and their information seeking actions, but also considers users' personal factors and information channels and sources in order to satisfy workers' task performance (Byström & Järvelin, 1995). In other words, Task Complexity begins with the task as perceived by the user, then considers the factors of users' education level, prior experience, personal factors (attitudes, motivation, and mood), information seeking style on information channels and sources, and finally examines the factors of situation (e.g. time available for performance the task) and organization (as a context) (Byström & Järvelin, 1995). As Johnson et al. (1995) indicate, Task Complexity views the information need as a gap between professional worker's knowledge and the task; information

seeking as an activity that can complete task requirement. So, Task Complexity is used to understand what factors affect professional workers to determine their behavior in seeking information in order to satisfy their information needs (Case, 2002).

2.1.2 Technology Acceptance Model and Teachers' Computer Self-Efficacy

Many studies (Chuttur, 2009; Davis, 1993; Davis & Venkatesh, 1996; Lee et al., 2000; Legris et al., 2003) indicate that the Technology Acceptance Model (TAM) is a useful model which integrates multiple theories and variables from social psychology and human process studies to understand what influences users' acceptance of a new information technology. Thus, the Acceptance Study (the second study) used the Technology Acceptance Model (TAM) as the basic model merged with other variables as the theoretical framework to study K-12 teachers' attitudes toward using educational portals for their lesson preparation. This section presents topics that are related to TAM and Teachers' Computer Self-efficacy (TCS).

2.1.2.1 Technology Acceptance Model

The original format of Technology Acceptance Model (TAM), which was proposed by Davis in 1989, focused on two important variables (i.e. perceived usefulness and perceived ease of use) to examine whether users accept (or not accept) information technology. According to (Davis & Venkatesh, 1996), "TAM was developed under contract with IBM Canada, Ltd in the mid-1980s....to evaluate the market potential for a variety of then-emerging PC-based applicationsin order to guide investments in new product development" (p. 20). According to

Davis (1989), the original format of TAM focused on two important variables: (1) “perceived usefulness” defined as the extent to which a person believes that using a particular system will enhance one’s job performance; and (2) “perceived ease of use” defined as the extent to which a person believes that using a particular system is effort-free (worth the effort).

Davis (1989) also states that users’ perceived usefulness and perceived ease of use are determinants of users’ behaviors to use or not use a system; and both determinants were supported by several theories (Self-efficacy theory, Cost-benefit paradigm, Adoption of innovations, and so on). Later, “TAM has been proven to be among the most effective models in the information systems literature for predicting user acceptance and usage behavior” (Davis & Venkatesh, 1996, p. 21). Figure 4 shows an adaptation of TAM with links to external variables (e.g. objective system design characteristics, computer self-efficacy, and the nature of the implementation process) to examine and predict users’ behavioral intention and actual usage of a technological system via the mediating role of perceived usefulness and perceived ease of use (Davis & Venkatesh, 1996).

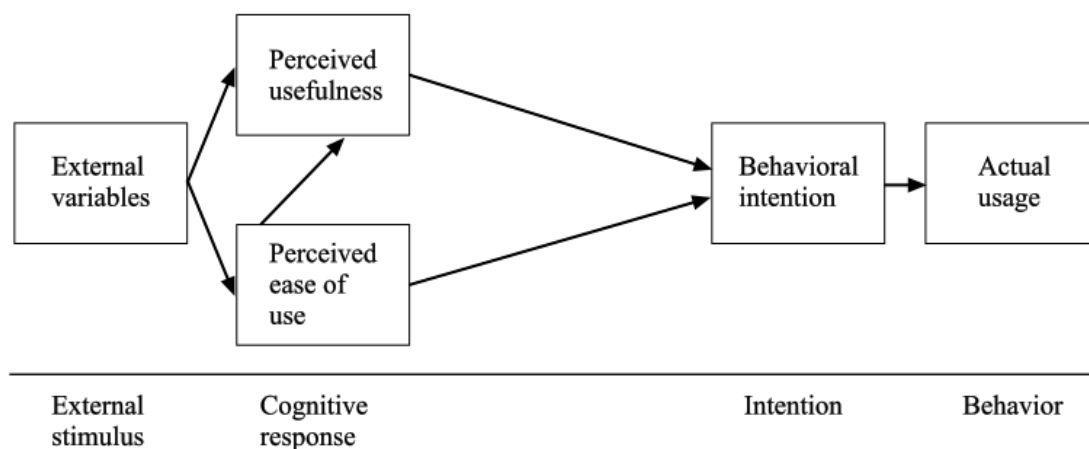


Figure 4. Technology Acceptance Model (TAM)

Moreover, Venkatesh & Davis (2000) created Technology Acceptance Model 2, which extended TAM, to understand users' adoption behavior by judging whether a system is capable of doing something related to an individual's job need in order to accurately understand an individuals' adoption behavior and acceptance. The two main variables, social influence processes and Cognitive instrumental processes, are described below.

- a) Social influence processes: includes three variables – subjective norm, voluntariness, and image. More specifically, Venkatesh & Davis (2000) indicated that what a system is capable of doing depends on the individual's need and the job. Subjective Norm is one of the important factors in social influence that is originally from the Theory Of Reasoned Action (TRA) and the Theory Of Planned Behavior (TPB) (Agarwal, 2000; Venkatesh & Davis, 2000). Subjective Norm refers to the “perceived social pressure to perform or not to perform the behavior” (Ajzen, 1991, p. 188).
- b) Cognitive instrumental processes: according to Venkatesh & Davis (2000), cognitive instrumental processes include (1) *Job Relevance* as a key component wherein individuals judge a system's application for supporting a potential users' job; (2) *Output Quality* as a system's performance and how well the system provides information to match the individual's job goal; (3) *Result Demonstrability* as system effectiveness and how useful such a system really is; and (4) *Perceived Ease of Use* anchored to one's computer efficacy and a direct determinant of perceived usefulness and individual intention.

2.1.2.2 Teachers' Computer Self-efficacy

Teachers' beliefs are an important factor since it influences their decision to accept or to reject technology in their teaching planning and activities. As Pajares (1997) stated, teachers' beliefs about their self-efficacy are associated with their instructional practices, activities, processes, and students' outcome. Thus, based on TAM, the Acceptance Study also included Teachers' Computer Self-Efficacy (TCS) to explore teachers' acceptance of educational portals since Teachers' Computer Self-Efficacy is expanded from self-efficacy.

Computer self-efficacy is an extension of self-efficacy that influences a person's perception and attitude towards information technology (Hu et al., 2003 and Paraskeva et al., 2008). Bandura (1997) proposed the term "Self-efficacy" not as concerned with one's skills, but as "the beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). In other words, self-efficacy refers to "people's beliefs about their capabilities to produce effects" and it "determines how people feel, think, motivate themselves and behave" (Bandura, 1994, p. 1). So, self-efficacy affects "human motivation, performance accomplishments, and emotional well-being" (Bandura, 2010, p. 1). The four main influential sources that affect a person's belief in performance of specific tasks proposed by Bandura (1994) are: (1) mastery experience (a person's previous successes and/or failure experiences), (2) vicarious experience (a person observed others' successes and/or failures), (3) verbal persuasion/social persuasion (a person has been persuaded by peers, colleagues, or others), and (4) affective arousal (emotional state: a person's emotional states such as anxiety, stress, arousal, and mood states).

An assessment of self-efficacy should consider multiple aspects of individual belief/confidence. During the last several decades, many researchers have pointed out personal self-efficacy can affect one's judgment and be a primary determinate of one's behavior in a specific environment and can predict a person's acceptance behavior (Bandura, 1982; Agarwal, 2000; Compeau & Higgins, 1995; Eastin & LaRose, 2000; Savolainen, 2002; Wagner, Hassanein, & Head, 2010; Zhang et al., 2012). For example, Compeau & Higgins (1995) pointed out that self-efficacy plays "an important role in shaping an individual's feelings and behaviors" (p. 203), so "individuals with a weak sense of self-efficacy will be frustrated more easily by obstacles to their performance and will respond by lowering their perceptions of their capability" (p. 192). Eastin and LaRose (2000) indicate that "self-efficacy is not a measure of skill; rather, it reflects what individuals believe they can do with the skills they possess" (p. 3). Savolainen (2002) states "self-efficacy theory predicts that whether a person undertakes a course of action depends on whether that person believes that s/he can perform such an action and do it successfully" (p. 220). So, self-efficacy is a central facet of social cognitive theories, which are used to understand the reciprocal relations between human behavior, cognition, and the environment (Sure, n.d.).

As researchers mentioned, self-efficacy is a major determinant that influences users' attitudes towards computers and the Internet (Agarwal, 2000; Hill, Smith, & Mann, 1987; Savolainen, 2002; Zhang et al., 2012). General self-efficacy positively influences computer self-efficacy (Looney, Valacich, and Akbulut, 2004). Compeau and Higgins (1995) indicated that computer self-efficacy refers to "a judgment of one's capability to use a computer" (p. 192), which has an impact on a person's expectations towards using computers. Compeau and Higgins

(1995) also identified three dimensions of one's computer self-efficacy: magnitude, strength, and generalizability. Definitions of these dimensions of computer self-efficacy are as follows:

(1) *The Strength of Computer Self-efficacy (TCSS)* “refers to the level of conviction about the judgment, or the confidence an individual has regarding his or her ability to perform the various tasks...” (Compeau & Higgins, 1995, p. 192). That is to say that computer self-efficacy strength reflects one's feeling confident in one's ability to successfully perform computing tasks.

(2) *The Generalizability of Computer Self-efficacy (TCSG)* “reflects the degree to which the judgment is limited to a particular domain of activity. Within a computing context.... individuals with high computer self-efficacy generalizability would expect to be able to competently use different software packages and different computer systems ...” (Compeau & Higgins, 1995, p. 192). In other words, computer self-efficacy generalizability refers to one's abilities on different domains of computer technology; and it shows that a person with high computer self-efficacy generalizability has more confidence in his/her ability to competently use different hardware and software packages.

(3) *The Magnitude of Computer Self-efficacy (TCSM)* is a judgment of “the level of capability expected Individuals with a high computer self-efficacy magnitude might be expected to perceive themselves as able to accomplish more difficult computing tasks than those with lower judgments of self-efficacy” (Compeau & Higgins, 1995, p. 192). That is, computer self-efficacy magnitude is one's belief/confidence in his/her ability to accomplish difficult computer tasks; and it shows that a person with a high computer self-efficacy magnitude has a higher belief/confidence in his/her ability to accomplish more difficult computer tasks.

Teachers' attitudes toward information technology are related to his or her computer self-efficacy (Compeau & Higgins, 1995 ; Khorrami-Arani, 2001 ; Paraskeva et al., 2008). As

Paraskeva et al. (2008) stated, teacher's computer self-efficacy "might determine to a considerable extent the ability to develop such technologies as an important educational tool" (p. 1085). In order to investigate what influences teachers' acceptance of educational portals in their lesson preparation, I borrow computer self-efficacy from Compeau & Higgins (1995) and combined with teachers' internet self-efficacy to understand whether teachers' computer self-efficacy affect their acceptance of educational portals as important resources.

2.2 THE OVERVIEW OF TEACHERS' INTEGRATION OF TECHNOLOGY

In education, the use of ICT has become an important part of what has, potentially, changed teachers' instructional practices (Bingimlas, 2009). Previous literature also has indicated a number of factors that influence K-12 teachers' integration of technology including technological effects, environmental factors, teachers' technology literacy, and/or teachers' personal factors and attitudes towards the acceptance of technology. This section presents a brief historical overview of the evolution of integration of technology in education, influences on the integration of technology in the classroom, and educational portals.

2.2.1 The Evolution of Integration of Technology in Education

Technology has significantly affected education. The integration of technology in education refers to "the act of including technology in teaching" (Koehler & Mishra, 2008, p. 6). Teaching with technology is constantly changing because of the continuous supply of newly available

technologies. A potential model for teachers' adoption of technology in education, which includes five stages: familiarization, utilization, integration, reorientation, and evolution, has been proposed by Hooper and Rieber (1995). Technological integration in teaching has been divided into three categories that have been continuously developed and evolved from low-level technologies through high-level technologies to computer level technologies (Kent and McNergney, 1999).

Low-level technology is traditional technology that includes pencils, chalkboards, textbooks or microscopes. High-level technology includes media such as film, video or television. Computer-level technology encompasses every possible computer, digital, and information technology from computer hardware and software applications, to the Internet. Each particular technology has its' own characteristics, biases, and attributes that make teachers' integration of technology even more complex. Although there are technically three levels of teaching with technology, current technological integration, narrowly defined, refers to computer technology (i.e. computer equipment, software applications, and other electronic devices such as computer-networks, hand-held devices, and the Internet (Davies, 2011)). This diversity of computer technology, combined with Internet offerings make this the most challenging technological level for teachers to apply to classroom instruction (Koehler & Mishra, 2008).

2.2.2 Influences on the Integration of Technology in the Classroom

Teachers incorporate technology into their teaching because they envision technology will reestablish their role and value in the classroom (Hooper & Rieber, 1995). Nevertheless, the use of technology, in particular ICT, for teachers has become a powerful tool which challenges,

changes, and reforms teachers' ways of managing the teaching-learning process (Fu, 2013; Schiller, 2003). The literature also shows that various factors have affected teachers' effective use of computers and the Internet: such as teachers' technology transformation process, teachers' technology literacy, institutional factors (i.e. school leadership), personal factors (i.e. knowledge, attitudes, perceptions, barriers such as lack of confidence and low belief in one's computer skills, and lack of equipment, time, technical association) and/or time constraints (Afshari et al., 2009; Balanskat et al., 2006; Dwyer, Ringstaff, & Haymore, 1994; Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Smerdon et al., 2000).

The Apple Classroom of Tomorrow (ACOT) project is one example that studied teachers' transformation process of using technology, from incorporating traditional low- and high-level technology to computer technology into their classrooms. This project pointed out that teachers' integration of technology efforts on the curriculum has a five-stage process: Entry, Adoption, Adaptation, Appropriation, and Invention (Dwyer et al., 1994). The Entry phase posits that teachers who start with text-based materials meet disorienting dilemmas of whether or not to incorporate technology into their teaching. The Adoption phase is when teachers show concern with how to integrate technology into their lesson plans, and begin to incorporate basic technology into their teaching. Then teachers move into the stage of adaption and integration of new technology into their classroom practices which occurs the third phase. In the Adaptation stage, teachers are furthering their understanding of how to acquire technology and plan for its usage in order to meet their instruction needs. Teachers enter into fourth phase, Appropriation, when they have positive attitudes towards using technology to support their teaching process. The final pinnacle phase is Invention, when teachers have confidence in their ideas about how to

use the new technology. The five phases are seen as a cycling process that indicates how teachers effectively integrate any and all new technologies to promote meaningful instruction.

Teachers' technological literacy/education is another example which directly affects teachers' integration of technology (Schaffer and Richardson, 2004; Tanni, Sormunen, & Syvänen, 2008). Teachers' technological education begins by educating teachers about hardware acquisition, then improving teachers' technological literacy, and then their technological fluency (Schaffer and Richardson, 2004). For hardware acquisition, teachers learned to see technology as a tool to support their teaching including the use of textbooks, whiteboards, projectors, TV, etc., as well as computers and Internet technology. Teachers' technological literacy training's purpose is to increase their awareness of technology, and to train and practice with new technology in order to adapt it for instructional classroom usage (Davies, 2011).

Currently teachers' technological education focuses on technological fluency, which requires teachers to build skill and knowledge in the use of technology (Schaffer & Richardson, 2004). Also, teachers' technological fluency is evaluated by measuring teachers' performance with technology in their classrooms (Schaffer & Richardson, 2004). There are also some significant elements that impact teachers' technological fluency directly, such as teachers' knowledge of different technologies; teachers' techniques and skills to access to different technologies; teachers' expectations and feedback related to the use of specific technologies when they perform tasks in the classrooms (Schaffer & Richardson, 2004). More specifically, ICT has a significant impact on education. Tahir et al. (2008) stated that different professional groups have their own information seeking behaviors and information needs. Altun (2007) also suggested that teachers' ICT integration in education needs to focus on four factors: ICT infrastructure and physical resource (related to ICT's hardware and software), curriculum and

policy development (related teachers' ICT competency), training opportunities (having modern technology instruction for teachers), and pedagogical training in ICT (related to teachers' pedagogy of Informatics that takes into consideration the teaching and learning process with technological support).

2.2.3 Educational Portals

“The basic definition of education portals is that it refers to portals that provide educational services to their users” (Kaur & Baba, 2006, p. 1). “Educational portals can be utilized in two ways as a supportive tool during [lesson] preparation, either to retrieve information or to share knowledge and information” (Pynoo, Tondeur, van Braak, & Duyck, 2012, p. 1309). Educational institutions have provided more electronic learning opportunities (Maldonado, Khan, Moon, & Rho, 2011) due largely to information technology developments. Although today's teachers in general are more familiar with technology (Mueller, Wood, Willoughby, Ross, & Specht, 2008); integration of technology in teaching-learning still remains a challenge for most teachers (Guzey & Roehrig, 2012; Pynoo et al., 2011). Presently, teachers view the Internet as an educational resource and find the Internet to be an important contributor of valuable information in current teaching (Tanni et al., 2008). This research focuses on studying how teachers seek information resources from ICT to support their teaching, particularly from educational portals, because educational portals are one of the products of the information environment created by computer technology and the internet. As Kaur & Baba (2006) stated, “the main task of the portals is to unify content and service into one area for people to access on the WWW” (p. 1). Butcher (2002) pointed out three types of educational portals.

- “ *Networking Portal* is a web portal that provides various individuals (educators, learners, managers, and administrators) with a central point from which to access various educational tools and facilities (online and offline);
- *Organizational Portal* is a portal constructed by a specific organization whose core business is to deliver educational material;
- *Resource-based Portal* is a portal, which provides access to various educational resources online. Generally these types of portals contain adequate search facilities, links to other relevant organizations or institutions as well as subscription services” (Butcher, 2002,p. 3).

The summary of the six important elements of networking education portals from the study of Kaur & Baba (2006) are: (1) Portal Characteristics: Kaur & Baba (2006) first reviewed various existing web portals (educational portals) and defined them into three portal characteristics including (a) gateways to information, (b) user-centric/community-based, and (c) multiple services to the community; (2) Features of Networking Education Portals that include a member area, a functional navigation menu, resources and references; (3) Presentation and Navigability of Information which includes a quantity of information presented, grouping and highlighting of information, screen display standardization, and usage of multimedia elements (e.g. pictures, diagrams, videos, and sound), and navigability); (4) Educational Effectiveness includes having a detailed explanation of the topics, online learning content, and learning process; (5) Interaction and Feedback; and (6) Technical Aspects which include speed, reliability, availability, and security.

Educational portals generally represent source gateways and/or educational applications through ICT for supporting schooling. According to Pynoo, Tondeur, van Braak, Duyck, et al.

(2012), educational portals play a facilitating role in helping teachers become familiar with and confident in using ICT; and teachers utilize educational portals as professional teaching content sources to support teachers' preparing and sharing knowledge and information in order to improve teaching materials and practices. Thus, it is important to study what factors affect teachers' information-seeking behaviors in using educational portals.

2.3 THE FACTORS DISCUSSED IN THE FACTOR STUDY

There are various factors that affect teachers' integration of technology such as the individual's background, personality, emotion, and environment (Afshari et al., 2009; Balanskat et al., 2006; Buabeng-Andoh, 2012; Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Koehler & Mishra, 2005; Usun, 2009). The following are key reasons for selecting these six factors

2.3.1 Teachers' Background and Prior Technological Experiences

The Factor Study definitely includes teachers' background and prior technological experience as first two factors. According to previous studies, teachers' individual characteristics – gender, age, individual educational level, and prior technological experience – can trigger reactions that directly affect teachers' adoption of new technology (Adediwura & Tayo, 2007; Afshari et al., 2009; Albirini, 2006; Balanskat et al., 2006; Buabeng-Andoh, 2012 ; Ertmer & Ottenbreit-Leftwich, 2010). In other words, the background and prior technological experiences are two important control variables that previous studies included when investigating teachers'

integration of technology, it is important to study whether these two factors also trigger teachers' adoption or rejection of information resources from web-based environments into their classroom. Thus, this study included the factors of the teachers' background and prior technological experiences. Besides these two factors, this section also discusses four other factors (i.e. TPACK, Extrinsic barriers, Intrinsic Barriers, and Attitude) that may affect K-12 teachers' information-seeking behavior and attitude towards the acceptance of ICT when teachers seek information resources from educational portals to facilitate their instruction.

2.3.2 Teachers' Technological Pedagogical Content Knowledge (TPACK)

Teachers' adoption of ICT into their teaching and learning depends on their teaching subjects and pedagogy knowledge together with their technological skills and its potential to be used in their lessons (Buabeng-Andoh, 2012). Davies (2011) stated that teachers are required to have content knowledge (subject knowledge) and pedagogical knowledge (knowledge of teaching methods and classroom management strategies) to teach effectively; to successfully and appropriately integrate technology into teaching-learning, teachers are also required to have technological knowledge (knowledge of how to use technology). Much research (Archambault & Crippen, 2009; Banas, 2010; Ertmer & Ottenbreit-Leftwich, 2010; Koehler & Mishra, 2005 & 2009) has verified that Technological Pedagogical Content Knowledge (TPACK) presents teachers' knowledge of how to incorporate technology into teaching specific subject matter in their classrooms. Hence, the Factor Study examined teachers' knowledge.

“The notion of Technological Pedagogical Content Knowledge (TPACK) appeared around 2005” according to Chai, Koh, & Tsai (2011, p. 596) as a means to view technology as an

approach to understand teachers' effective teaching (Koehler & Mishra, 2005). TPACK is a framework based on Shulman's (1986) ideas of pedagogical content knowledge (PCK) to consider teachers' technological knowledge and skills in order to meet teachers' needs when integrating technology into instruction in specific content areas (Koehler and Mishra, 2005& 2009). Figure 5 (below) shows the framework of TPACK with the interrelationship among content knowledge, pedagogical knowledge, and technological knowledge. Archambault & Barnett (2010) also pointed out that TPACK is useful "when conceptualizing how the affordances of technology might be leveraged to improve teaching and learning" (p. 1656). Thus, the goal of this study is to better understand whether teachers' TPACK also influences their use of ICT to create meaningful instruction in specific subject matter. To determine this, it is necessary to examine the relationship between K-12 teachers' TPACK and their information seeking behaviors when using educational portals.

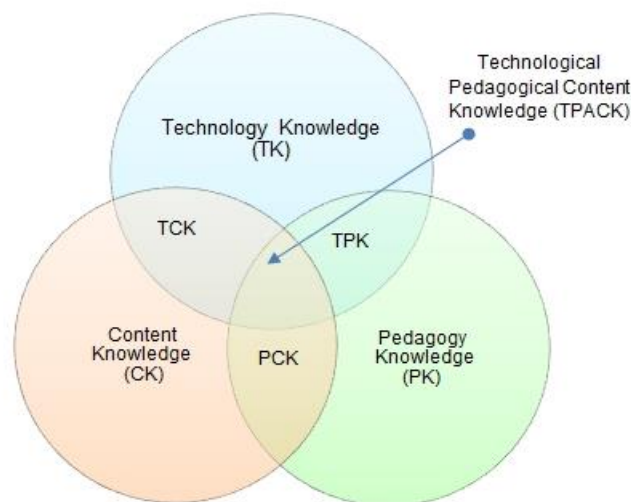


Figure 5. The TPACK Framework (Koehler & Mishra, 2005)

2.3.3 Teachers' Extrinsic and Intrinsic Barriers

As Schoepp's (2005) pointed out, “a barrier is defined as any condition that makes it difficult to make progress or to achieve an objective” (cited from Wordnet, 1997, p. 2). Researchers (Bingimlas, 2009; Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Mumtaz, 2000) indicated teachers have a strong desire to integrate ICT into education, but the barriers that teachers encountered discouraged them from using technology. As Fu (2013) stated, the barriers teachers encounter will affect teachers' attitudes, perceptions, and confidence in using ICT.

The literature indicates that teachers who have more barriers using technology are less confident and thus less likely to integrate technology in their teaching. Thus, more and more researchers have begun to consider teachers' barriers regarding the integration of technology in the classroom. For instance, the British Educational Communications and Technology Agency [BECTA] shows that school leadership and technology resourcing would influence teachers' successful integration of new technology into the classroom (Bingimlas, 2009). Thus, BECTA classified barriers into two categories: teacher level barriers and school level barriers (Jones, 2004). The teacher-level barriers exist on an individual/personal level such as teachers' lack of time, confidence, and access to resources, resistance to change and negative attitudes, and no perception of benefits; whereas the school level category focuses on the institutional barriers such as lack of time, effective training and access to hardware, poor quality software, inappropriate organization, and technical problem (Jones, 2004, p. 20). Balanskat et al. (2006) classified teachers' barriers to technological integration into three categories based on the BECTA's study. The first and second categories retain the teacher level and the school level; however, they identified a third category, which they called system level barriers. These barriers

relate to the “educational system itself and its rigid assessment structure that impedes the integration of ICT into everyday learning activities” (Balanskat et al., 2006, p. 6), including the “rigid structure of traditional education systems, traditional assessment, restrictive curricula and restricted organizational structure” (Balanskat et al., 2006, p. 55).

However, my research focuses on learning how the barriers that teachers encounter can challenge their strategy for technological integration. I applied Ertmers’ ideas, since her study examined how and why teachers are using technology in instruction and how these different barriers affect ongoing technological integration in the teachers’ classroom (Ertmer, 1999). There are two barriers that Ertmer (1999) identified as influencing teachers’ usage of technologies in instruction. First-order barriers are defined as the extrinsic factor, such as limited access to computers and software, insufficient training time to plan instruction, and inadequate technical and administrative support. Second-order barriers are defined as intrinsic factors such as teachers’ lack of beliefs and confidence in teaching with technology. In other words, the Factor Study borrowed the ideas of Ertmer (1999) to understand whether teachers’ extrinsic and intrinsic barriers significantly influence teachers’ information-seeking behavior when seeking materials in the educational portals.

2.3.4 Teachers’ Attitudes towards Using Technology

Last, but not least, teachers’ attitude is another major influential factor affecting whether or not teachers integrate technology into their classrooms. For example, researchers (Albirini, 2006; Banas, 2010; Bullock, 2004; Mumtaz, 2000; Sadik, 2006; Sahin-Kizil, 2011; Yüksel & Kavanoz, 2011) address teachers’ attitudes as major predictors in the process of ICT integration into

instruction. Also, Ertmer et al. (2012) describes teachers' attitudes toward using technology as having the biggest impact on their teaching design. As Yüksel & Kavanoz (2011) point out, the process of planning for technology use not only should consider the teacher's beliefs and knowledge about technology, but also teachers' attitudes towards technology. Specifically, teachers' positive attitudes (intention, feeling of like and comfort) would be the most important factors in the implementation of technology. Mumtaz (2000) stated that teachers with positive attitudes preferred to acquire ICT into their teaching and more successfully made use of ICT in the classroom than those with a negative attitude towards ICT.

2.4 THE LITERATURE REVIEW OF THE RESEARCH METHOD

2.4.1 Brief Introduction of Mixed-Methods Approach

Creswell (2009) states that there are three type of research approaches: qualitative, quantitative, and mixed methods. The distinction among these three approaches is that quantitative research uses numbers (closed-ended information and/or quantitative hypotheses) while qualitative uses words (open-ended information/interview questions); and mixed-methods research incorporates elements of both qualitative and quantitative research (Creswell, 2009). The definition of the mixed-methods approach is “at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words), where neither type of method is inherently linked to any particular inquiry paradigm” (Creswell & Clark, 2010, p. 2). Creswell (2009) also stated that a mixed-methods approach is “an approach to inquiry that combines or associates both

qualitative and quantitative...it is more than simply collecting and analyzing both kinds of data; it also involves the use of both approaches in tandem so that the overall strength of a study....[is enhanced]” (p. 4). Likewise, Ritchie & Lewis (2003) states the mixed-methods approach “can be used in tandem to study the same or different phenomena”. This dissertation is exploratory research that attempts to provide a better understanding of K-12 teachers’ information-seeking behavior in using educational portals, thus mixed-methods has been chosen as the most appropriate approach to use.

“No single method is research’s be-all and end-all” (Krathwohl, 2009, p. 615), but a mixed methods approach often provides an opportunity to use qualitatively identified effects to supplement the quantitative data results, or to explore for a general understanding before validation of a solution (Krathwohl, 2009). That is, the mixed-methods approach is a “multi-method matrix” that converges methods across qualitative and quantitative paradigms “within a single study or within multiple studies in a program of inquiry” (Creswell & Clark, 2010, p. 8). In other words, the philosophical underpinnings of mixed methods research is neither positivism/post-positivism with deductive logic nor constructivism with inductive logic, it is pragmatism with both deductive and inductive logics (Creswell & Clark, 2010).

Figure 6 presents the data used in mixed-methods research consisting of both numerical and textual/pictorial data items. Creswell & Clark (2010) categorize these designs as a convergent parallel design, the explanatory sequential design (initially Quantitative), the exploratory sequential design (initially Qualitative), the embedded design, the transformative design, and the multiphase design as follows:

(a) *The convergent parallel design* refers to the design that “occurs when the researcher uses concurrent timing to implement the quantitative and qualitative strands during the same

phase of the research process, prioritizes the methods equally, and keeps the strands independent during analysis and then mixes the results during the overall interpretation” (Creswell & Clark, 2010, pp. 70-71).

(b) *The explanatory sequential design* (initially Quantitative) refers to the design that “occurs in two distinct interactive phasesThis design starts with the collection and analysis of quantitative data, which has the priority for addressing the study’s questions...The researcher interprets how the qualitative results help to explain the initial quantitative results” (Creswell & Clark, 2010, p. 71).

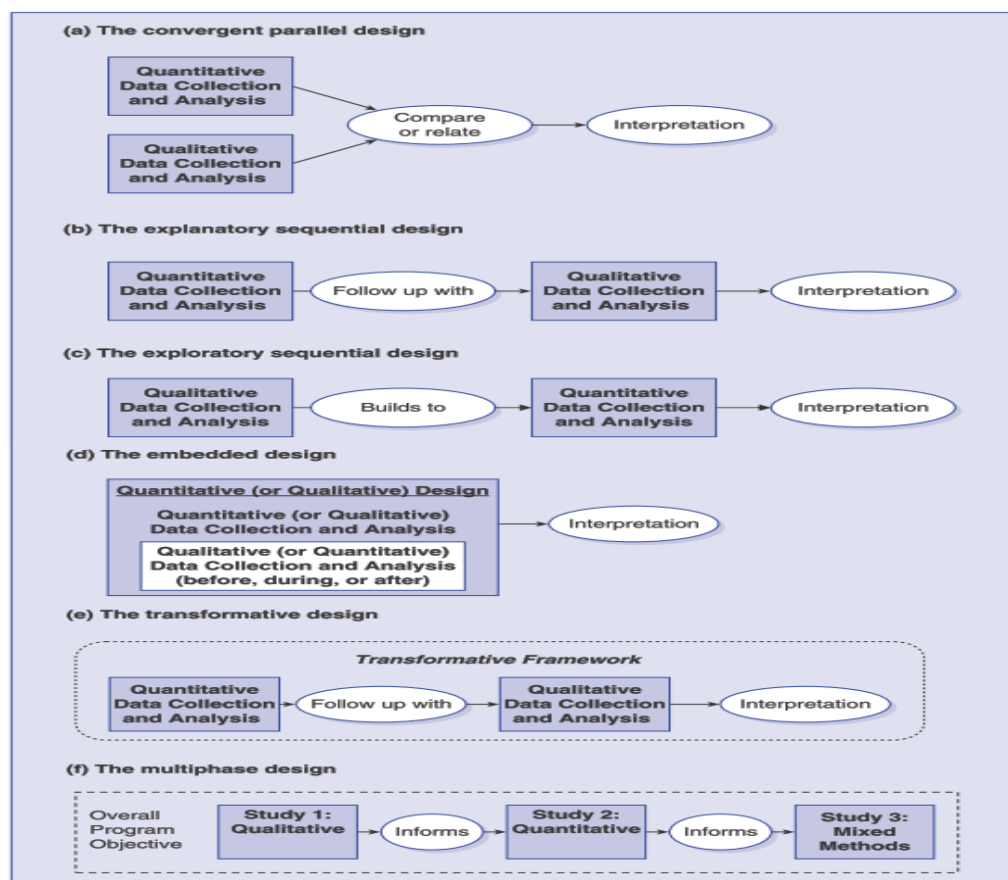


Figure 6. The Mixed-Methods Designs from Creswell & Clark (2010, pp. 69-70)

(c) *The exploratory sequential design* (initially Qualitative) refers to the design that also “uses sequential timing. In contrast to the explanatory design, the exploratory design begins with and prioritizes the collection and analysis of qualitative data in the first phase.... The researcher then interprets how the quantitative results build on the initial qualitative results” (Creswell & Clark, 2010, p. 71).

(d) *The embedded design* “occurs when the researcher collects and analyzes both quantitative and qualitative data within a traditional quantitative or qualitative design.... The supplemental strand is added to enhance the overall design in some way” (Creswell & Clark, 2010, pp. 71-72).

(e) *The transformative design* and (f) *The multiphase design* are complex designs. The transformative design uses a transformative theoretical framework; Figure 6 (e) is a possible approach to design that researchers can select to uncover the research results by first utilizing the data quantitatively and then qualitatively (Creswell & Clark, 2010). The multiphase design (Figure 6 - f) “combines both sequential and concurrent strands over a period of time that the researcher implements within a program of study addressing an overall program objective” (Creswell & Clark, 2010, p. 72).

Data analysis is the process that assists researchers in understanding the meaning of the data collected in a research project. Since this dissertation uses a mixed methods research paradigm, mixed method analysis techniques are indispensable in order to understand how to analyze quantitative and qualitative data sets. There are many statistical methods (including descriptive and inferential statistics) which are powerful tools to analyze the quantitative data sets. However, which statistics should be used to analyze the data depends on the data collections. Although this dissertation has been conducted using both quantitative and qualitative

approaches, the quantitative approach deals with numbers to understand the data set by using descriptive and inference statistical analysis to deduce true relationships and to understand particular situations or problems. Therefore, I would like to explain my choice of statistical techniques more when I used them in that section of my study. In following sections, I would like to focus on qualitative data analysis: particularly content analysis and grounded theory.

2.4.2 Content Analysis

Qualitative data is often in the form of words, which usually include rich descriptions and interesting information that can explain one's study effects. Miles & Huberman (1994) outlined a view of the general ideas of qualitative analysis with "three concurrent flows of activities: data reduction, data display, and conclusion drawing/verification" (p. 10). Figure 7 shows that the explanations of these activities are: (1) *data reduction* as "the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcripts" (p. 10) and this process continues until a final report is completed; (2) *data display* is the second major data activity that organizes, compresses, and assembles the information/data before having data conclusion drawing/verification, and it can also include "many types of matrices, graphs, charts, and networks" (p. 11); (3) *conclusion drawing/verification* won't happen "until data collection is over, depending on the size of the corpus of field notes, the coding, storage,... conclusions are also verified as the analysis proceeds " (p. 11), and its verification is also very important for researchers (Miles & Huberman, 1994). Also, the interaction model of the data analysis is included with these activities (data reduction, data

display, and conclusion drawing/verification) and data collection is interweaved in parallel form during and after data collection (Miles & Huberman, 1994, p. 14).

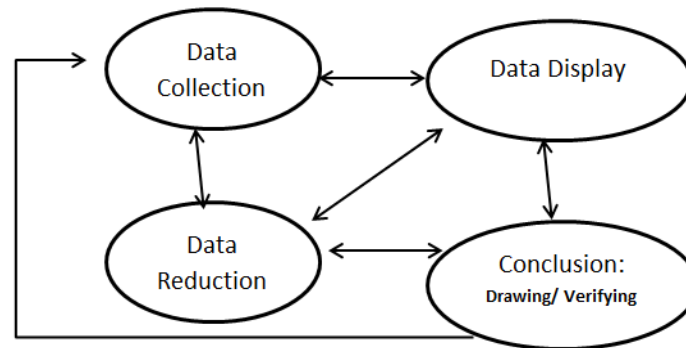


Figure 7. Components of Data Analysis: Interactive Model (Miles & Huberman, 1994, p14)

A broad definition of content analysis from Holsti (1969) is "any technique for making inferences by objectively and systematically identifying specified characteristics of messages" (p. 14). Also, Weber (1990) indicated that content analysis "classifies textual material, reducing it to more relevant, manageable bits of data" (p. 5). Similarly Stemler (2001) states, "the content analysis is as systematic, replicable technique for compressing many words of text " (p. 7).

There are many ways to perform content analysis. For example, Weber (1990) shows that the techniques of content analysis should include: document selection and sampling, text encoding, key-word-in-context (lists and concordance), word-frequency lists, retrieval from coded text, and category counts in order to derive/count the useful information from data sets. Hsieh & Shannon (2005) classify qualitative content analysis into three approaches: (1) *conventional content analysis* which is derived directly from the text data; (2) *directed content approach* starts with a theory or relevant research to find guidance as to initial codes; and (3)

summative content analysis involves counting and comparing (usually of keywords or content) to interpret the context. Walker and Myrick (2006) indicate grounded theory begins with basic description and then extracts a series of codes from the collection set. Also there are two data analysis processes of grounded theory from the ideas of Glaser and Strauss (1967; as cited in Walker and Myrick, 2006): “the analyst codes all data and then systematically analyzes these codes to verify or prove a given proposition” (p. 548); and “the analyst does not engage in coding data per se but merely inspects the data for properties of categories, uses memos to track the analysis, and develops theoretical ideas” (p. 548). Thus, the grounded theory is a well-defined process to augment data analysis when the preconceived categories do not match the observed data.

Stemler (2001) also points out two approaches to coding data as follows: Emergent verses *a priori* coding. For dealing with coding data, *a priori* coding is necessary to be considered since it is the base that relates the research project with professional knowledge to classify meaningful categories (Stemler, 2001). For dealing with emergent coding, Stemler (2001) mentions that “categories are established following some preliminary examination of the data” (p. 3). The following processes were proposed by Haney, Russell, Gulek, & Fierros (1998; as cited in Stemler, 2001):

- (1) “First, two people independently review the material and come up with a set of features that form a checklist”;
- (2) “Second, the researchers compare notes and reconcile any differences” that show up on from the comparison of their initial checklists;
- (3) “Third, the researchers use a consolidated checklist” to independently code a sample of the data;

- (4) “Fourth, the researchers check the reliability of the coding.... If the level of reliability is not acceptable, then the researchers repeat the previous steps. Once the reliability has been established, the coding is applied on a large-scale basis”;
- (5) “ The final stage is a periodic quality control check” (Stemler, 2001, p. 3).

To analyze the interview data of my Acceptance Study, I used two approaches for the two one-on-one interview data sets: (1) deductive – following an already-determined set of codes (*a priori*) from theories/themes/variables, and (2) inductive – where the codes/themes emerge from the data. So, the grounded theory approach is considered with the inductive approach, since it is generally used for semi-structured interviews.

3.0 METHODOLOGY

This dissertation is an exploratory investigation using a mixed-methods approach which is divided into two studies. The two studies, that make up this dissertation, correspond to the following two main research questions in order to achieve the goal of this dissertation: to develop a model that benefits educators and instructional technologists in designing and building effective educational portals that meet teachers' specific needs when they seek information on ICTs to support their lesson preparation.

RQ1: Which factors critically influence K-12 teachers' information-seeking behavior when teachers seek information from educational portals to be incorporated into course design? The six factors being considered are Background, Prior technological Experiences, TPACK, Extrinsic Barriers, Intrinsic Barriers, and Attitude.

RQ2: What variables influence K-12 teachers' acceptance of educational portals as the information resource for their lesson preparation? The five variables considered here are Teachers' Computer Self-efficacy, Time Issues, Social Influences, System Interface, and Content Quality.

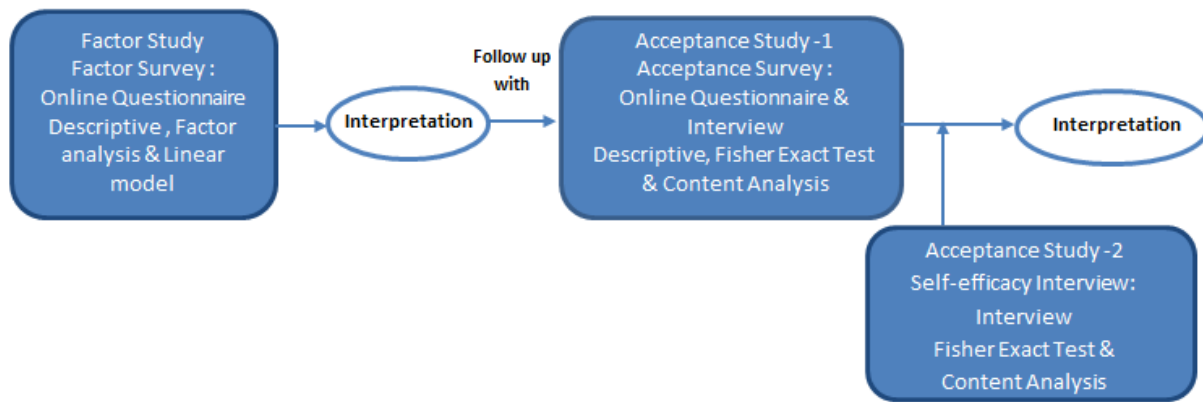


Figure 8. The Concept Framework of Research Design

Figure 8 (above) shows the conceptual framework of the research design for this dissertation that includes two studies (the Factor Study and the Acceptance Study) that use two surveys and two interviews to collect data. First, I conducted the Factor Survey with an online questionnaire to broadly examine the relationship between the six factors identified in RQ1 and information-seeking behavior. Second, I had one additional online questionnaire and two interviews in the Acceptance Study. The first part of the Acceptance Study (Acceptance Study-1) is called the Acceptance Survey to examine what variables, of those five variables identified in RQ2, influence K-12 teachers most when using educational portals. The Acceptance Survey was analyzed using a mixed-methods approach, with an online questionnaire (Acceptance Survey Questionnaire) and a one-on-one interview (Acceptance Survey Interview) as data sources, to accurately probe for meaningful information from the target population. The second part of the Acceptance Study (Acceptance Study -2) is called the Self-efficacy Interview, with a semi-structure interview, to explore Teachers' Computer self-efficacy when dealing educational portals.

The following four sections present the methodology used to answer the research questions: the design of the Factor Study, the design of the Acceptance Study, the rationale for the selection of participants and the portals: EAGLE and four additional portals that are included in the study.

3.1 THE FACTOR STUDY RESEARCH DESIGN

This section presents the research framework, strategies, and data analysis process for the Factor Study.

The goal of the Factor Study was to explore what factors influence K-12 teachers' information needs and information-seeking activities. Information needs and information-seeking activities are factors created by factor analysis on the variables in questions Q23 and Q15, respectively (see Table 7 and Table 8). The Factor Study drew on the theoretical concept of Task Complexity in Information Seeking (Byström & Järvelin, 1995) to understand what factors affect teachers in determining their information-seeking behavior in order to satisfy their lesson preparation needs (See Figure 9). There are many factors that influence K-12 teachers' usage of computer technologies as outlined in Section 1.1. The six principal factors chosen for this study are (1) Background – including demographic, educational, and teaching background; (2) Prior Technological Experience; (3) Technological Pedagogical Content Knowledge (TPACK); (4) Extrinsic Barriers (related to interface design, system support, and time issues); (5) Intrinsic Barriers (related to participants' beliefs and confidences); (6) Attitude – Intentions, Personal Preferences, and Comfort level. These function as independent variables to understand whether

these factors influence K-12 teachers' information-seeking behavior when they seek information from educational portals as information resources to be incorporated into course/lesson preparation. The rationale for choosing these six factors was previously outlined in Section 1.1.

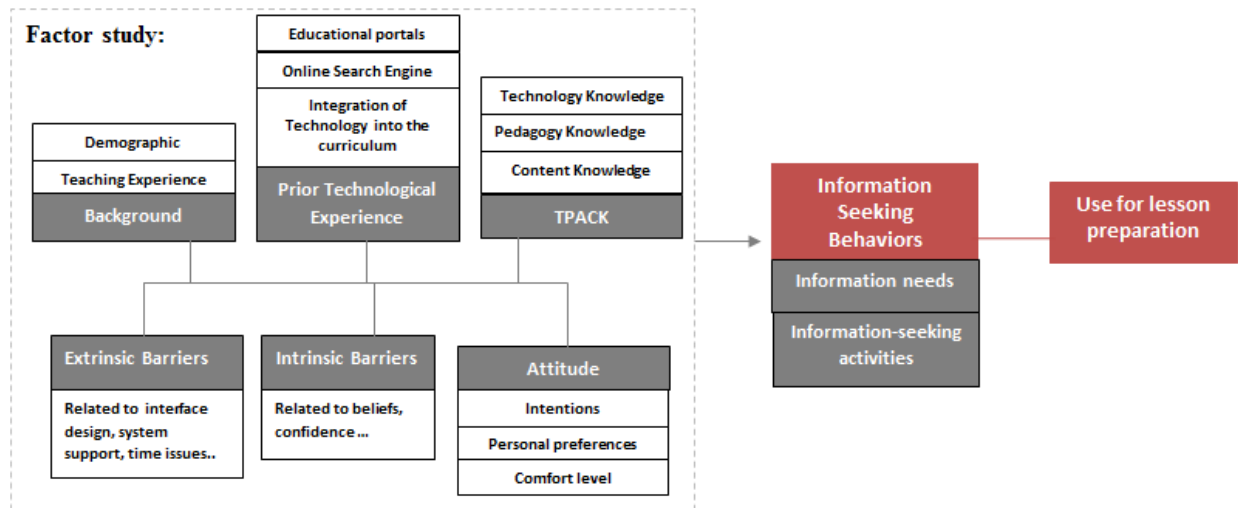


Figure 9. Framework of the Factor Study

In order to answer the main *Research Question (RQ1)* of the Factor Study, I included three sub-research questions (below) to explore the relationship between the six factors and information-seeking behavior. The *RQ1-1* focuses on associations among the six factors to understand whether these factors interactively influence each other. *RQ1-2 and RQ1-3* focus on whether these factors individually influence K-12 teachers' information-seeking behavior via two dependent variables: Information needs and Information-seeking activities.

- *RQ1- 1:* For K-12 teachers using educational portals, how are the six factors related to each other?

- *RQ1-2*: When using educational portals, are teachers' information needs related to these various factors?
- *RQ1-3*: When using educational portals, are teachers' information seeking activities related to these various factors?

3.1.1 Research Strategies of the Factor Study

To answer RQ1 and its related sub-research questions, I conducted the Factor Survey, a web-based questionnaire, to collect the data pertaining to *RQ1* in order to answer the research questions in the Factor Study as discussed above. The Factor Survey came from two sources: literature search (existing studies on the factors influencing teachers' technological integration in the classroom) and discussions with professional workers at NCTA, which focused on the six identified factors that were suspected to be important for understanding K-12 teachers and their information-seeking behavior (including information needs and information-seeking activities) when the teachers use educational portals (See Appendix A: Factor Survey for the text of the 25 questions that made up the online survey).

The Factor Survey first collected teachers' background information that included gender, age, major in university, degree earned, years of teaching experience, and subject(s) taught, based on guidelines from the National Center for Education Information [NCEI] (Feistritzer, 2011). The Q1 to Q7 collected participants' background information.

Second, the Factor Survey recorded teachers' prior technological experiences including the teachers' internet access mechanism, how often they incorporated technology into their classrooms, how often they used online search engines to search for teaching materials, and

whether they had used educational portals previously. The Q8 to Q11, Q13, and Q14 collected the teachers' prior technological experiences.

Third, the Factor Survey examined teachers' TPACK via a set of questions that allowed respondents to self-report their knowledge of content, pedagogy (strategy and practices of the subject), and technology (using various tools). The responses were collected on the Q12 to Q16 and Q17 with a 5-point Likert scale.

Teachers' barriers are classified into two categories – Extrinsic and Intrinsic Barriers. The Extrinsic Barriers consider system-level (environmental) barriers. The Q24 in the Factor Survey focused on collecting the information concerning accessibility/availability, adequate support and training, time required to use, and interface obstacles such as lack of well-organized content and poor interface design. The Intrinsic Barriers focus on personal barriers such as lack of belief, confidence, time, and skills to incorporate materials from educational portals to their teaching practice, as well as colleagues' opinions and the reputation of portals. The Q25 in the Factor Survey focused on teachers' intrinsic barrier. The data collected for both types of barriers was collected with multiple-choice questions.

The questions about teachers' attitudes are related to participants' intentions toward using material from educational portals in their lesson planning, as well as their personal preference and comfort level using the portals to support their teaching preparation. They were all collected on Q20 to Q22 with a 5-point Likert scale or single-choice question in the Factor Survey.

Finally, teachers' information-seeking behavior included two aspects – Information Needs and Information-Seeking Activities – to explore the reasons why teachers seek information on the portals, and how they do their search when they seek information on the portals (including browsing, searching/retrieving, deriving, sharing, and communicating). The

questions related to information needs and information-seeking activities, Q23 and Q15, used a 5-point Likert scale with multiple-choice questions. Actual numeric values for information needs and information-seeking activities came from a factor analysis.

The Factor Survey was created with the Qualtrics survey system. The participants overall took an average of 30 minutes to complete the 25 question online survey consisting of multiple-choice questions (single or multiple selections), short-answer questions, and questions with answers on a 5-point Likert scale.

3.1.2 Data Analysis Process of the Factor Study

Data analysis was conducted using SAS 9.3 and included two sections of analysis – descriptive, factor analysis, and general linear models – to understand the relationship among the aforementioned factors. Descriptive statistics were used to describe the main features from data collections and to summarize the results from the data. Factor analysis and general linear models were used to address three research questions to further analyze the relationship among the six important factors, teachers' information needs and information seeking activities.

To accurately select variables to fit linear models to answer the research questions, I first performed a bivariate analysis to understand the associations among the six factors. Also, I conducted factor analysis to construct several factors variables (i.e. TPACK, Attitude, Information Needs and Information-Seeking Activities). The reason I created these factor variables is because these factors are complex concepts that cannot be directly measured with one question in a questionnaire. For example, the TPACK factor is a three part concept and

cannot be measured by only asking one question. So, I performed factor analysis to construct a TPACK factor from the knowledge of technology, pedagogy, and content questions in the survey.

3.2 THE ACCEPTANCE STUDY RESEARCH DESIGN

This section presents the research framework, strategies, and data analysis process of the Acceptance Study.

3.2.1 Research Framework of the Acceptance Study

The goal of the Acceptance Study was to understand why K-12 teachers accept (or do not accept) using educational portals as information resources for lesson preparation. The Acceptance Study used Davis' Technology Acceptance Model (TAM) as the basic model, integrating it with variables to investigate K-12 teachers' acceptance of educational portals, which is going to be measured by combining Perceived Usefulness and Perceived Ease of Use. Figure 10 shows the framework of the Acceptance Study, which is highlighted in the blue box linking the two main variables of TAM (Perceived Usefulness and Perceived Ease of Use) and five variables to investigate what influences K-12 teachers' attitudes toward using educational portals as information resources for lesson preparation. Based on the literature review (discussed in section 2.1.2) and the results of my Factor Study (discussed in section 4.2 and 4.3), the five variables are: Teachers' Computer Self-efficacy (TCS), Time Issue, Social Influence, System Interface and Content Quality (all these variables are from factor study questionnaire).

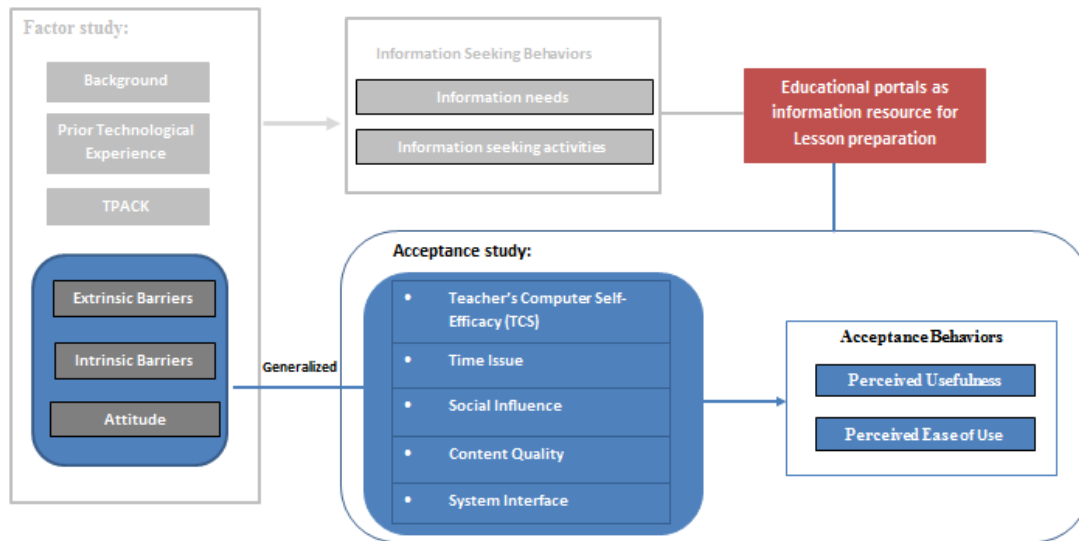


Figure 10. The Framework of the Acceptance Study

In order to answer the main *Research question* of the Acceptance Study (*RQ2*), I included five sub-research questions (below) to determine which variables influence K-12 teachers to accept and to use educational portals as information resources for lesson preparation.

- *RQ2-1*: How do different K-12 teachers' backgrounds affect their acceptance of the portals?
- *RQ2-2*: a) Which variables influence K-12 teachers' acceptance and actual use of educational portals, in general, as information resources for lesson preparation?
b) Does teachers' acceptance of EAGLE as an information resource differ from their acceptance of other educational portals
- *RQ2-3*: Is teachers' information-seeking behavior significantly related to their acceptance and actual usage of educational portals?
- *RQ2-4*: What interface functions support K-12 teachers' use of educational portals as information resources for lesson preparation?

- *RQ2-5*: Whether Teachers' Computer Self-efficacy (TCS) should be considered as an important variable that influences K-12 teachers' acceptance and actual usage of portals?

3.2.2 Research Strategies of the Acceptance Study

Most previous researchers have used quantitative methods to study the Technology Acceptance Model (TAM); however, a few studies have applied a mixed-methods approach. I used a mixed-methods approach to analyze quantitative and qualitative data in order to study the research questions in the Acceptance Study as discussed above. The cross-checking approach of the questionnaire and interviews allowed for a thorough understanding of the why, how, and what reasons that influence teachers' acceptance of the portals.

In the Acceptance Study, I included two parts of the survey to answer *RQ2* and its related sub-research questions. The first part of the Acceptance Study, the Acceptance Study-1, is the Acceptance Survey that consisted of an online questionnaire (Acceptance Survey Questionnaire) and a one-on-one interview (Acceptance Survey Interview) to collect data related to teachers' acceptance and interface questions concerning educational portals. Thus, in order to have completed the first part of the Acceptance Study, the participants must have finished the Acceptance Survey Questionnaire and Acceptance Survey Interview. The purpose of the Acceptance Survey Questionnaire was to broadly understand K-12 teachers' attitudes, feelings, and prior experience in using educational portals (see Appendix B). The Acceptance Survey Interview took a holistic perspective to further and deepen this study's understanding of the teachers' feelings, opinions, experiences of dealing with educational portals, and considerations of interface design of the portals (see Appendix C).

The second part of the Acceptance Study, the Acceptance Study-2, is the Self-efficacy Interview that explored Teachers' Computer Self-efficacy with a semi-structured interview. It also was conducted to specifically explore the relationship of teachers' self-beliefs to their computer capabilities (see Appendix D for the structure of the interview). Thus, the Self-efficacy Interview aimed to get more effective information about whether teachers' feelings, thoughts and motivations (teachers' computer self-efficacy) influence their acceptance of educational portals as information resources. Thus, the data-collection methods of the Acceptance Study are the Acceptance Survey Questionnaire, the Acceptance Survey Interview and Self-efficacy Interview.

(1) The Acceptance Survey Questionnaire:

The Acceptance Survey Questionnaire first collected data pertaining to the K-12 teachers' background in Q1 to Q6. They are used in general research studies to identify the participants' basic demographic information including gender, age, highest degree earned, and teaching experience based on guidelines from the National Center for Education Information [NCEI] (Feistritzer, 2011). To understand more about K-12 teachers, I then collected information about their technological experience (i.e. internet access, computer capabilities, previous experience of using ICT – using online engines, any educational portals, and EAGLE) to investigate whether these variables affected participants' acceptance and actual usage of educational portals. The results of these questions were to answer the *RQ2-1*. In addition, the teachers needed to provide short answers about the benefits of using online search engines and educational portals in order to understand why participants use online search engines and educational portals to seek information (or why not). These were Q7 to Q12, Q15 and Q17 in the questionnaire.

The second part of the Acceptance Survey Questionnaire merge concepts from the literature and from Davis's (1993) TAM survey to design my survey relating teachers' use of educational portals to K-12 teachers' Perceived Usefulness and Perceived Ease Of Use when using education portals. These questions were designed to collect independent data sets to understand K-12 teachers' Perceived Usefulness and Perceived Ease Of Use when they use educational portals to seek information resources (see Appendix B – Part II: Question 13 to14).

The Acceptance Survey Questionnaire also collected responses to understand the participants' information-seeking behavior and their perceptions of interface design from the five educational portals that are identified below. The Q16 and Q18 were the questions that addressed *RQ2-3* that related to information-seeking behavior and to examine whether K-12 teachers' information-seeking behavior on a specific portal, EAGLE, was different from that with other general educational portals.

In the Factor Study, the results showed that teachers were concerned with educational portals' interface design. The Q19 to Q24 was designed to understand thoroughly whether interface design would be important to assist teachers' acceptance of educational portals. These questions were designed to answer *RQ2-4* that included a comparison of components from five educational portals' system interface designs to scrutinize what system interface features K-12 teachers were most concerned with and may enhance their attitudes toward using educational portals. The Five portals used are EAGLE (<http://www.eagle.pitt.edu/>), Asia for Educators (<http://afe.easia.columbia.edu/>), American Memory (<http://memory.loc.gov/ammem/index.html>), and Pennsylvania Standards Aligned System (<http://www.pdesas.org/>), and the History World (<http://www.historyworld.net/>). The four additional educational portals came from the participants in my Factor Study when I requested that they recommend a general educational

portal to be used as a comparison to EAGLE. The questions asked K-12 teachers to evaluate sixteen features from the four educational portals that weren't provided by EAGLE. Thus, the participants were requested to evaluate EAGLE's system interface, to rate the importance of four other portals' features, and then if possible, to list what should be improved in these portals' features.

The format of the questions on the Acceptance Survey Questionnaire was similar to the Factor Survey that was created by Qualtrics survey system with multiple-choice questions (allowing single or multiple selections) with a 4-point Likert scale and short answers questions to broadly understand K-12 teachers' attitudes and prior experience with educational portals. Also, to preclude equivocal responses from the participants, I have used even numbers (a 4-point Likert scale) instead of odd number of possible responses to prevent the participants from choosing neutral choices. As DeVellis (2003) has indicated, "An odd number implies a central 'neutral' point An even number of responses, on the other hand, forces the respondent to make at least a weak commitment in the direction of one or the other extreme" (p. 77).

There are 87 items (24 questions and their sub-questions) included on the online questionnaire that consisted of three parts – teachers' background and prior experience with technology, teachers' perceived usefulness and perceived ease of use of educational portals (adapted from Davis's TAM survey), and questions related to interface design and content quality (See Appendix B for the entire Acceptance Questionnaire).

(2) The Acceptance Survey Interview

The purpose of the Acceptance Survey Interview in this dissertation is to elicit the facts as to why K-12 teachers use (or do not use) educational portals to seek information resources

when preparing their lessons, and whether the system interface and content quality provided will affect K-12 teachers' decisions to adopt the portals. It lasted around one hour and was voice-recorded, and teachers were able to make sketches and/or take notes during the interview.

In order to get more meaningful information from the participants, the Acceptance Survey Interview included 12 questions (see Appendix C) to answer *RQ2-2* and to support *RQ2-4* and *RQ2-5*. The participants had the opportunity to give their experiences in using any kind of educational portals and a specific portal, EAGLE. In the general educational portals (Q7 to Q9), they had to answer three questions: (1) What are the major reasons for K-12 teachers to use or not to use educational portals; (2) What are user-friendly aspects of educational portals for teachers when searching for resources on the portals; (3) What kind of educational portals can be said to have a well-organized design when seeking information resources on the portals. In a specific educational portal (Q10 to Q12), EAGLE, the participants only focused on their experience in using EAGLE (<http://www.eagle.pitt.edu/>) in order to comprehensively understand what functions actually affect K-12 teachers' acceptance of educational portals as follows: (1) Why do you use EAGLE; (2) As a teacher, would you consider EAGLE to be a useful portal for you to seek information from to support your teaching or why not; (3) Would you consider EAGLE to be a user-friendly and well-organized portal to find resources for your teaching or why not?

The Acceptance Survey Interview included 12 questions that lasted around one hour, it was voice-recorded and teachers were able to contribute notes and sketches during the interview.

(3) The Self-efficacy Interview

The Acceptance Study-2 is composed of a Self-efficacy Interview that was designed to cross check the results from *RQ2-2* and to answer *RQ2-5*. According to the literature review (see literature review 2.1.2) and the Factor Study results, teachers' confidence and belief in their ability to perform computer tasks influence them to use educational portals as information resources when preparing lessons. However, the importance of Teachers' Computer Self-Efficacy (TCS) was unclear in the Acceptance Study-1; therefore, the Acceptance Study-2 focused on TCS to ask participants to self-report their Teachers' Computer Self-Efficacy to thoroughly investigate teachers' beliefs/confidence in their computer capability and how teachers' beliefs/confidence influences their capability to seek information from educational portals as information resources.

The Self-efficacy Interview was created with ideas from Compeau and Higgins (1995) to measure three dimensions of computer self-efficacy – Strength, Generalizability, and Magnitude (see Appendix D for the interview questions) in order to completely investigate K-12 Teachers' Computer Self-Efficacy (TCS). In other words, the questions of TCS concerned how teachers' judgment on their beliefs/confidence in using computers and Internet technology influence their lesson preparation. The details of these dimensions are as follows: (1) Teachers' Computer Self-Efficacy Strength (TCSS) – to measure teachers' confidence/belief/feelings – whether they feel confident or, conversely, feel anxiety, stress, etc. when performing computer technological tasks; (2) Teachers' Computer Self-Efficacy Generalizability (TCSG) – to assess whether a teacher believes he/she has the ability to use different domains of computer technology and/or willingness to use a new system; and (3) Teachers' Computer Self-Efficacy Magnitude (TCSM)

– to judge whether a teacher believes he/she has the capability to accomplish difficult computer tasks. Q1 to Q7 were designed to answer Teachers’ Computer Self-Efficacy Strength, Q8_1, Q_1, and Q10 were designed to answer Teachers’ Computer Self-Efficacy Generalizability, and Q8_2, Q9_2 and Q11 Teachers’ Computer Self-Efficacy Magnitude. The Self-efficacy Interview included 11 questions with a semi-structured interview that also lasted around one hour with voice-recorded and teachers were able to contribute their notes during the interview.

3.2.3 Data Analysis Process of the Acceptance Study

Descriptive statistics, Fisher's exact test, and content analysis were used to analyze the data collected from the Acceptance Survey and Self-efficacy Survey. The following four sections describe the analysis process.

(1) Descriptive Statistics for Acceptance Survey Questionnaire

The data analysis of the Acceptance Survey Questionnaire on the Acceptance Survey is a set of descriptive analyses that identified the main features of the data collected and summarized the data results from the online questionnaires. In other words, the data analysis of the Acceptance Survey Questionnaire used descriptive statistics to identify the main features of the collected data including summarizing the participants’ demographic, previous experiences of using ICT, and teachers’ acceptance of educational portals via perceived usefulness, and perceived ease of use. It addresses the *RQ2-4*.

(2) Tests for Relationships among Teachers' Responses

I used Fisher's Exact Test to analyze the data from the Acceptance Survey and Self-efficacy Interview since the sample size was small in the Acceptance Study. The Fisher's Exact Test is preferred over the Chi-squared test when the expected value of any cell in the table is less than five, which is the case in these tests. The purpose of this analysis is to explore whether different teachers' backgrounds affect their acceptance of the portals (*RQ2-1*), which variables influence teachers' acceptance of the portals (*RQ2-2*), how teachers' information-seeking behavior is related to acceptance of educational portals (*RQ2-3*) and whether there is a relationship between TCS and acceptance of educational portals (*RQ2-5*).

(3) Content Analysis Method Used

The reason for conducting the content analysis, on the interview survey data, is that content analysis is the "longest established method for text analysis" to help researchers transform raw data into a standardized form; and researchers are able to judge, discover, and describe the meaningful data from participants' answers (Kohlbacher, 2006). Similarly, Downe-Wamboldt (1992) stated that the goal of content analysis is "to provide knowledge and understanding of the phenomenon under study" (Hsieh & Shannon, 2005).

The data analysis of the Acceptance Survey Interview and Self-efficacy Interview uses content analysis. Content analysis provides a means to accurately obtain more meaningful information from the participants to support the research results. In other words, I used two approaches to analyze both interview data collections: (1) deductive – following already-determined set of codes (*a priori*) from theories/themes/variables, and (2) inductive – observing

a phenomenon from the data set and merging in new codes where the codes/themes in the prior code set were inadequate, which involved grounded theory to summarize observations into categories. Grounded theory is an inductive approach to develop a systematic theory, since it begins with basic description, codes all data, extracts a series of codes from the collection set and then develops theoretical ideas (Walker and Myrick, 2006).

For the deductive approach, I used two approaches of qualitative analysis: *directed content approach* and *summative content analysis*, which was proposed by Hsieh & Shannon (2005): (1) *directed content approach* starts with a theory or relevant research to find guidance as to initial codes; and (2) *summative content analysis* involves counting and comparing (usually keywords or content) to interpret the context. Therefore, the directed content approach uses deductive categories to work with previously formulated theories and to highlight theoretical aspects from the data (Kohlbacher, 2006). The summative content analysis approach for this study incorporated keyword frequency (for each occurrence of the identified keywords) in the text dataset and which explored keyword usage in the content text in order to make manifest latent content (Hsieh & Shannon, 2005).

(4) Content Analysis Procedure

Having a directed content approach and a summative content approach assisted me to code teachers' interview data set and answer the rest of research questions in this Acceptance Study. However, to make the coding reliable for categorizing data, it is necessary to have exhaustive categories that represent the data set (Stemler, 2001). Thus, this dissertation considered the use of grounded theory since "grounded theory endeavors to integrate the strengths inherent in quantitative methods with qualitative approaches" (p. 548); and it can "set

out, gather data, and then systematically develop the theory derived directly from data” (Walker & Myrick, 2006, p. 548).

Overall, I have borrowed ideas from Kohlbacher (2006) merged with Walker and Myrick (2006) and Stemler (2001) (See section 2.4) to create my own content analysis procedure (Figure 11 below) that consists of two parts for the content analysis. Based on the audio recordings, sketches and notes that interviewers provided during their interview, the content analysis included two processes: (1) Teachers’ Transcripts Collection Process and (2) Data Content Analysis Process.

The Teachers’ Transcripts Collection Process began with the participants’ audio recordings and notes. To validate the transcript dataset, which included transcripts of each recording session and a summary, and to insure data reliability, the final stage of the Teachers’ Transcripts Collection Process was to send back all the transcripts to each participant for verification before continuing the Data Content Analysis Process.

The Data content analysis process included five stages as follows (Figure 11):

- Stage 1 had predetermined codes by following relevant theories and/or prior research as guidance for the initial codes (directed content approach).
- Stage 2 began to code with a predetermined set of codes (the initial codes) (summative content approach).
- Stage 3 used input from grounded theory when the preconceived categories did not match the observed data, in which case the categories which came from the theory were augmented by categories observed in the data. So, Stage 3 was information mergence by reading through transcripts again to link up cross-categories relationship, and if necessary, to merge the related concepts with

existing categories or create new code or sub-code schema (directed content approach and grounded theory).

- Stages 4 used new coding categories as the final code agenda and counted the keywords again (summative content approach).
- Stage 5 interpreted and visualized the relationship of data collections.

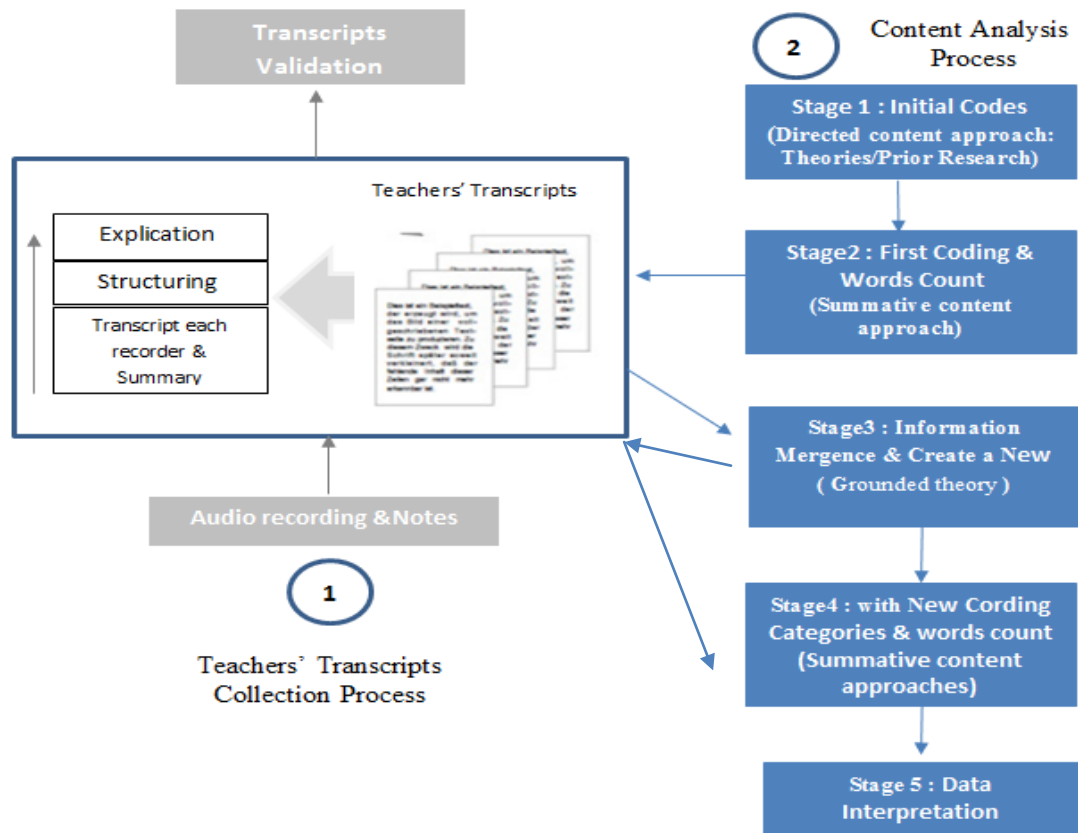


Figure 11. The Content Analysis Content Process in the Acceptance Study

In analyzing the Acceptance Survey, I used existing theories (TAM and self-efficacy theory) to create key categories as *directed content approach* to function as the initial coding

categories, and then I used ground theory to observe phenomena from the data set in order to augment and merge the new codes/themes into the *a priori* code sets. For counting the keywords, I used Atkasi.ti (a computer program) since it is equipped to help researchers identify complex phenomena and to locate, code, annotate and visualize complex relationships in the data. It was developed by Thomas Murhr at Technical University in Berlin (<http://www.atlasti.com/index.html>).

The purpose of the Self-efficacy Interview is specifically to explore the relationship between TCS in three dimensions – Strength, Generalizability, and Magnitude to cross-check results from the Acceptance Survey (see Appendix F: Self-efficacy Interview transcripts). Thus, each of these dimension is analyzed by Bandura's original aspects (1994) with four main sources because these sources affect a person's belief in performance of the specific proposed task. The four main sources are: (1) mastery experience (a person's previous success and/or failure experiences), (2) vicarious experience (a person observation of others' successes and/or failures), (3) verbal persuasion/social persuasion (a person has been persuaded by peers, colleagues, or others), and (4) affective arousal/emotional state (a person's emotional states such as anxiety, stress, arousal, and mood states).

In summary, the data analysis of the Acceptance Survey interview and the Self-efficacy Interview were conducted using content analysis (Figure 11 above). They began with Teachers' Transcripts Collection Process to create of a transcript from the interviewer and each participant was given the opportunity to make any corrections or additions s/he wanted in order to make data transcripts more reliable and valid before starting the Data Content Analysis Process. Also the Data Content Analysis Process considered the directed content approach and a summative content approach (from Hsieh & Shannon, 2005) and grounded theory (from Walker and Myrick,

2006) in order to answer *RQ2-2*, *RQ2-4*, and *RQ2-5* in this dissertation. The content analysis coding scheme is included as Appendix H.

3.3 PARTICIPANTS

This dissertation is concerned with understanding K-12 teachers who are interested in incorporating subject matter from web-based information technology into their classrooms. For consistency and convenience, as well as for professional knowledge, all the participants I recruited were K-12 teachers (including participants who also worked as principals or librarians) from the NCTA alumni (National Consortium for Teaching about Asia) who had an account on EAGLE (the *East Asia Gateway for linking educators*; <http://noborders.ucis.pitt.edu/eagle/>) (formerly called the NCTA Teacher Portal). All the participants were (1) interested in bringing the subject matter, East Asia, into their classroom, (2) have taught in K-12 schools (in-service teachers), and (3) have taken professional content training, the East Asia courses at NCTA, in the University of Pittsburgh and had prior experience using the resources from EAGLE to facilitate their teaching (to incorporate Japan, China, and Korea content into their curricula).

In the Factor Survey, there was a total 100 participants who joined the online survey but only 85 of them completed the survey. We assume that participants who did not complete the survey failed to do so because of the length of time required to complete the survey which was approximately 30 to 45 minutes. The Acceptance Survey was based on the Factor Study results to better understand what influences K-12 teachers' attitudes towards using educational portals when they seek information resources for lesson preparation. Thus, the Acceptance Survey-1

recruited fourteen K-12 teachers who were self-selected (volunteered) to participate in the survey from the Factor Study participants, but only twelve teachers' attended the interview. The other two participants failed to contact researcher to schedule the interview. Thus, there are twelve participants who completed the first part of the Acceptance Study. Additionally, two participants identified themselves as librarians and two identified themselves as principals in the Acceptance Survey Interview; however, all four of these participants were currently functioning as teachers and were instructed to focus on their responsibilities as teachers rather than educational staff when answering any questions. For the Self-efficacy Interview in the Acceptance Study-2, seven of the participants from this group continued to the next interview stage

Recruitment for the study was performed by NCTA staff, and volunteers were instructed to contact the researcher to arrange for participation in the study. The study was approved by the University of Pittsburgh IRB (Appendix G).

3.4 THE PORTALS USED

EAGLE and four other portals were included in this dissertation as target platforms. *East Asia Gateway for Linking Educators* (EAGLE; <http://noborders.ucis.pitt.edu/eagle/>) was created and provided by the National Consortium for Teaching about Asia (NCTA) at the University of Pittsburgh. This study took place from 2012 to 2014 using a version of the EAGLE website which has subsequently been updated and improved. The purpose of the National Consortium for Teaching about Asia (NCTA) is to encourage and facilitate teachers to use high quality East Asia resources in their K-12 curriculum (<http://www.nctasia.org/>). NCTA is a nationwide

program funded by the Freeman Foundation, launched in 1998. It is a collaboration of the East Asian Studies programs of seven institutions -- Columbia University, Five College Center for East Asian Studies at Smith College, Indiana University, the University of Colorado, the University of Pittsburgh, the University of Southern California, and the University of Washington. The goal of the National Consortium for Teaching about Asia (NCTA) is to be the premier provider of valuable resources for the professional development of K-12 teachers interested in including materials into their classroom about modern and historical East Asia.

EAGLE is an open online resource of materials for teaching. It provides resources to review and download about East Asia (textual materials and photographic materials), so teachers can share teaching materials and their own ratings and reviews of materials. That is the reason why EAGLE (formerly called the NCTA Teacher Portal) was used as a platform to accurately figure out whether teachers' acceptance would be different from using any general educational and a subject specific subject portal like EAGLE. Besides the main page, EAGLE included four sections – “Teaching Materials Database” (currently called “Book and Resources”), “Contributed materials” (currently called “Lesson Materials”), “Photo Gallery”, and “Tour Blogs.” The interface features included keyword search and search filter, with professional culture notes, photo pictures, and sample lessons.

There were four other portals with sixteen design features that weren't provided at EAGLE and were recommended by the Factor Study participants as useful portals, which were used to understand thoroughly what other interface features would be important to assist with teachers' acceptance of educational portals. The four educational portals are: Asia for Educators (<http://afe.easia.columbia.edu/>), American Memory (<http://memory.loc.gov/ammem/index.html>), The Pennsylvania Standards Aligned System (<http://www.pdesas.org/module/content/search/>),

and History World (<http://www.historyworld.net/>). The purpose of evaluating the Asia for Educator page is to compare EAGLE to other pages that also provide Asian content for faculty and students to learn world history, culture, geography, art, and literature, as well as the Library of Congress' American Memory which includes items from the public domain of American resources (e.g. images, videos) and History World which provided historical content. The Pennsylvania Standards Aligned System is designed by Pennsylvania Department of Education as a collaborative product for K-12 teachers which all the participants had searched through.

4.0 FINDINGS AND DISCUSSIONS OF THE FACTOR STUDY

4.1 INTRODUCTION

This chapter reports on and discusses the findings of the Factor Study (the first study). As outlined in Section 1.3, in order to understand how K-12 teachers handle information resources in educational portals, the Factor Study uses the theoretical concept of Task Complexity to explore the types of problems that teachers encounter when seeking to utilize educational portals for lesson preparation. From the previous studies (see Chapter 2), we know that the key factors influencing teachers' integration of technology into their classrooms are either the personal characteristics of teachers or the external environment in which the teachers' work (Teo, Chai, Hung, & Lee, 2008). Despite the existing research regarding factors affecting teachers' integration of technology into classrooms, little attention has been paid to exploring the relationship between K-12 teachers' personal and/or contextual factors and their information-seeking behavior in the educational portals.

To address this lack of attention, the Factor Study explores what factors influence K-12 teachers' information needs and information-seeking activities when preparing lessons. The goal of the Factor Study is to assist in the development of a model that benefits educators and instructional technologists to build effective educational portals to meet teachers' specific needs when seeking information in support of teaching preparation. Thus, the Factor Study used a web-

based questionnaire (created with the Qualtrics survey system) in order to understand the relationships among the six important factors of K-12 teachers and their information-seeking behavior when teachers use educational portals as information resources for their lesson preparation (see Section 3.1 for Research Design).

4.2 THE FOCUS OF THE FACTOR STUDY

This study has identified six important personal and/or contextual factors: (1) Background—including demographic, educational, and teaching background; (2) Prior Technological Experiences; (3) Technological Pedagogical Content Knowledge (TPACK); (4) Extrinsic Barriers (related to interface design, system support, and time issues); (5) Intrinsic Barriers (related to participants' beliefs and confidences); (6) Attitude – Intention, Personal Preference, and Comfort Level as independent variables.

One key reason for selecting the six prominent factors is that teachers' background and prior technology experience are two important control variables that previous studies have included when investigating teachers' integration of technology into their classrooms. Thus, it is important to investigate whether these two factors also trigger teachers' adoption or rejection of information resources from web-based environments into their classrooms (Adediwura & Tayo, 2007; Afshari et al., 2009; Albirini, 2006; Balanskat et al., 2006; Buabeng-Andoh, 2012 ; Ertmer & Ottenbreit-Leftwich, 2010). The second reason is that many researchers have indicated that teachers' knowledge and attitudes are important factors that influence teachers' information-seeking behavior directly or indirectly when they integrate ICT into their classroom (Bingimlas,

2009; Davies, 2011; Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Mumtaz, 2000; Schiller, 2003). Finally, Ertmer (1999) addresses teachers' extrinsic barriers such as lack of resources, adequate training, technical support, and time that are related to teachers' intrinsic obstacles such as belief and perception about technological integration, and lack of confidence in using computer technologies.

The main *Research Question (RQ)* of the Factor Study is *RQ1*: Which factors critically influence K-12 teachers' information-seeking behavior when teachers seek information from educational portals to be incorporated into course design? The six factors considered are Background, Prior technological Experiences, TPACK, Extrinsic Barriers, Intrinsic Barriers, and Attitude. The following are three sub-research questions:

- *RQ1- 1*: For K-12 teachers using educational portals, how are the six factors (Background, Prior Technological Experiences, TPACK, Attitude, Extrinsic Barriers and Intrinsic Barriers) related to each other?
- *RQ1-2*: When using educational portals, are teachers' Information Needs (a factor score previously discussed in section 3.1) affected by these various factors?
- *RQ1-3*: When using educational portals, are teachers' Information-Seeking Activities (a factor score previously discussed in section 3.1) affected by these various factors?

4.3 RESEARCH FINDINGS

The findings reported here are derived from the online questionnaire as outlined in Chapter 3.0 Methodology. The questions in the survey came from two sources: existing studies on the

factors influencing teachers' integration of technology into the classroom and discussions with professional staff of the NCTA. Participants took an average of 15-20 minutes to complete 25 questions on the online questionnaire composed of multiple-choice questions (single or multiple selections), short answer questions, and questions with answers on a 5- point Likert scale (see Appendix A for the questionnaire).

4.3.1 Descriptive Statistics for the Factor Study

Descriptive statistics are used to describe the main features from the data collection and to summarize the results from the data. It includes participants' Background, Prior Technological Experiences, Technological Pedagogical Content Knowledge (TPACK), Extrinsic Barrier, Intrinsic Barriers, and Attitude toward integration of technology, Information Needs, and Information-Seeking Activities.

4.3.1.1 Participants' Background

There were 100 K-12 teachers who participated in the survey. Table 1 shows 85 of them fully completed the questionnaire (as noted early, it is assumed the fifteen, who failed to complete the survey, did so due to time issues). Participants included 63 females (74% of the sample) and 22 males (26% of the sample). The largest age group of participants was between 30 to 39 years old, which included 26 participants (31%); the next largest group consisted of 23 participants (27%) over 60 years old. For the participants' educational degree, 77% held a Master's degree or higher. The educational major distribution of participants was split among

Education (54%); Liberal Arts and Sciences (33%) – including fine arts, history, anthropology, political science, English, and ESL; and other majors including information and library science (4%), law (6%), and an additional 4% in business, engineering and zoology.

Table 1. Participants’ Backgrounds (Factor Study)

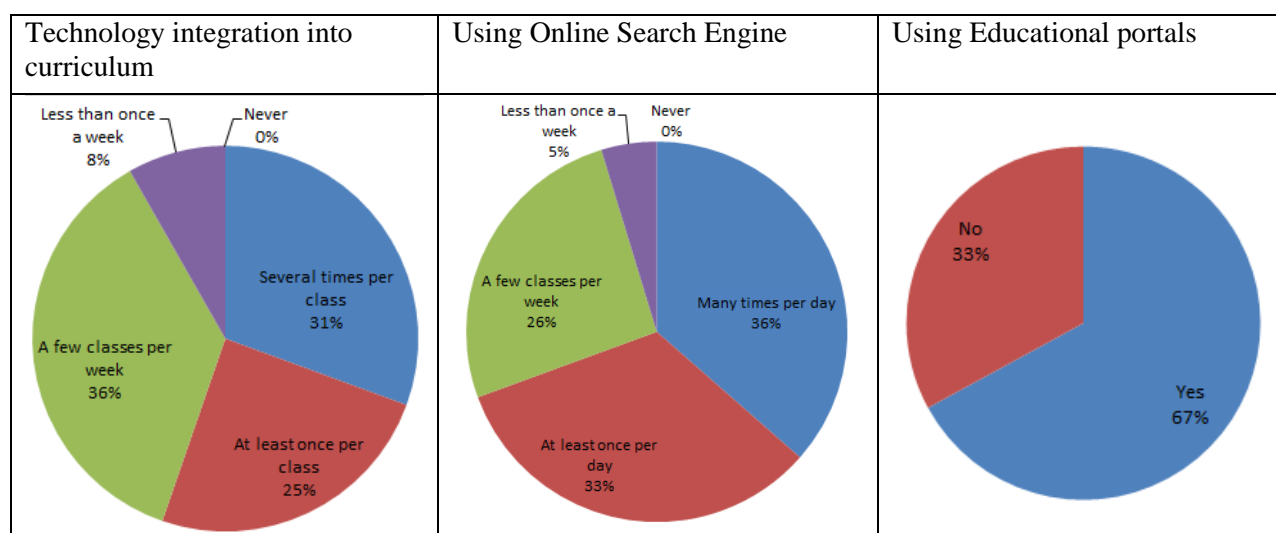
		n	%
Gender	Male	22	26%
	Female	63	74%
Age	≤ 29	6	7%
	30-39	26	31%
	40-49	12	14%
	50-59	18	21%
	60 +	23	27%
Degree	Bachelor	12	15%
	Master	65	77%
	PhD	7	8%
Major	Arts (Anthropology, Art, History, English, ESL, Political & Religious Studies)	28	33%
	Education	46	54%
	Others (Business, LIS, Electrical Engineers, Law, & Zoology)	11	13%
Subject taught	World History & Literature	43	23%
	Social Studies	42	23%
	World Geography	19	10%
	Fine Art	16	9%
	Global Studies	14	8%
	World Literature	13	7%
	Language	12	6%
	Others	25	14%
Years of Teaching	1-5	8	9%
	6-9	11	13%
	10-14	21	25%
	15-24	21	25%
	25 +	24	28%
Grades taught	PK- 4 th	15	14%
	5 th – 8 th	26	24%
	9 th – 12 th	61	56%
	College	6	6%

Table 1 also shows the participants' list of subjects taught included world history (23%), social studies (23%), as well as other domains such as world geography (10%), arts (9%), and global studies (8%). Over 75% of the participants had more than 10 years of classroom teaching experience: 10-14 years (25%), 15-24 years (25%), and over 25 years (28%). The majority of participants (56%) taught at the high school level in grades 9-12.

4.3.1.2 Participants' Prior Technological Experiences

Every participant was able to access the Internet at school and 98% from their home. Prior technological experiences as independent variables come from responses to Q11, Q13, and Q14 of the Factor Study survey (Table 2).

Table 2. Descriptive Summary of Participants' Prior Technological Experiences



All participants had experience using technology to supplement their teaching; of those, 31% reported using technology many times per day, and 25% used it at least once per day in the classroom. However, 25% of the participants thought that the schools did not provide enough equipment for them to incorporate technology into their teaching. Thus, there were still 8% of participants who were only integrating technology into their teaching less than once per week. In addition, all of the participants had experience using online search engines (e.g. Google, Bing etc.) to find teaching materials. Sixty-nine percent of the participants used these search engines at least once per day (36% used them many times per day). However, 33% of the participants did not use an educational portal to find teaching materials other than the EAGLE portal.

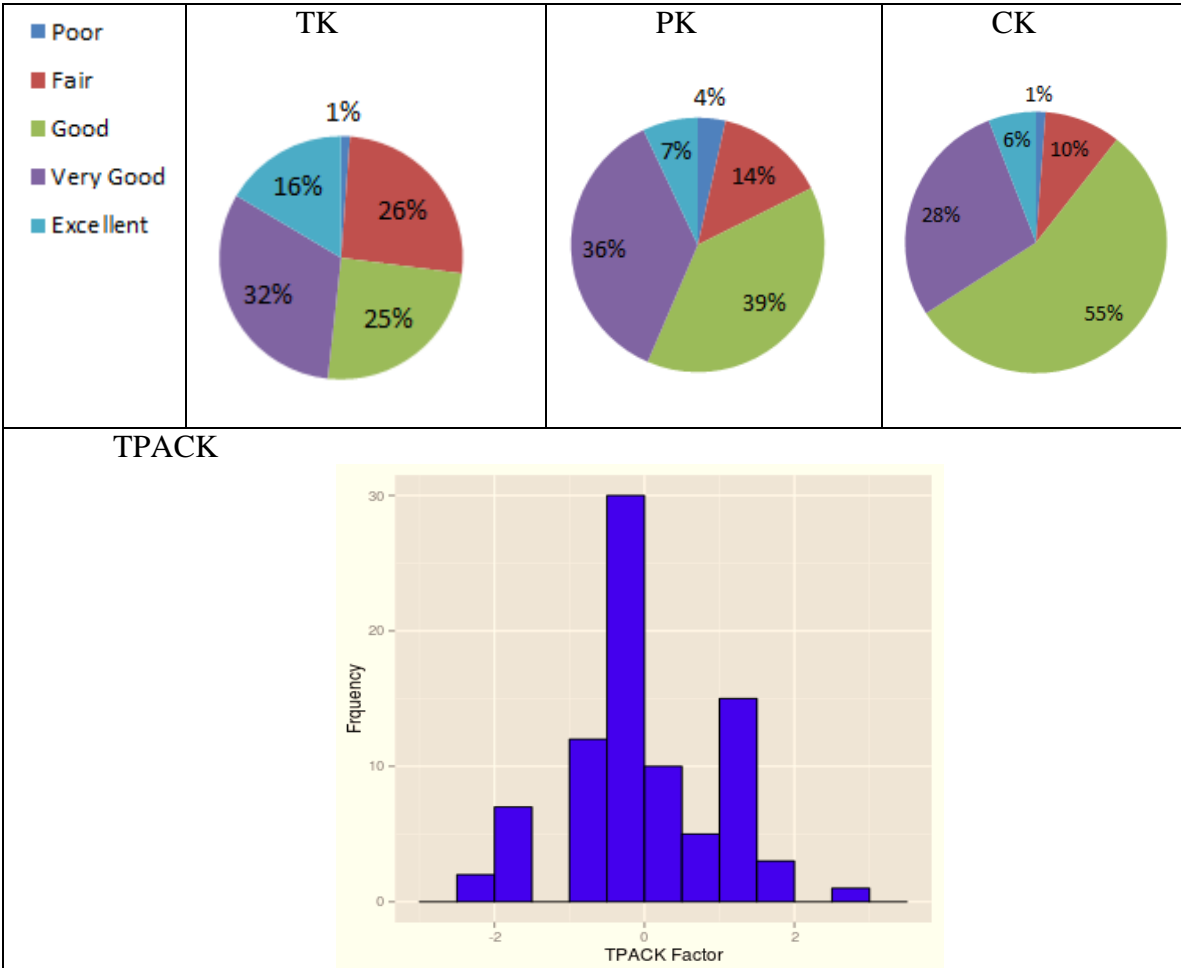
4.3.1.3 Participants' TPACK

Table 3 shows the participants' self-confidence in technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and the distribution of their TPACK scores. In Table 3, 73% of the participants reported themselves as Good to Excellent in their TK, but still 26% of the participants reported themselves as only Fair with their TK, and 1% reported Poor technological competence. While 4% of the participants have Poor PK, 82% of the participants reported Good to Excellent and 14% Fair with their pedagogical competence. Almost 90% of the participants are "Good" to "Excellent" with their subject knowledge, while 10% feel they are only "Fair" with their CK. Overall, most participants are satisfied with their TK, PK and CK.

TPACK is the factor extracted from TK, PK, and CK by the factor analysis preform in this Factor Study. TPACK scores range from -2.4 to 2.6 with a mean of 0 and standard deviation

of 1. Table 3 shows the distribution of sources factors (TK, PK, and CK) and the distribution of the TPACK score.

Table 3. TPACK and Its Sources



4.3.1.4 Participants' Extrinsic Barriers to Educational Portals

“Extrinsic barriers” is represented as a count variable (0-9) created by summing the number of positive responses to Q24 in the Factor Study Survey. It is used in the Factory study to measure barriers external to the individual participants.

Table 4. Descriptive Summary of Extrinsic Barriers

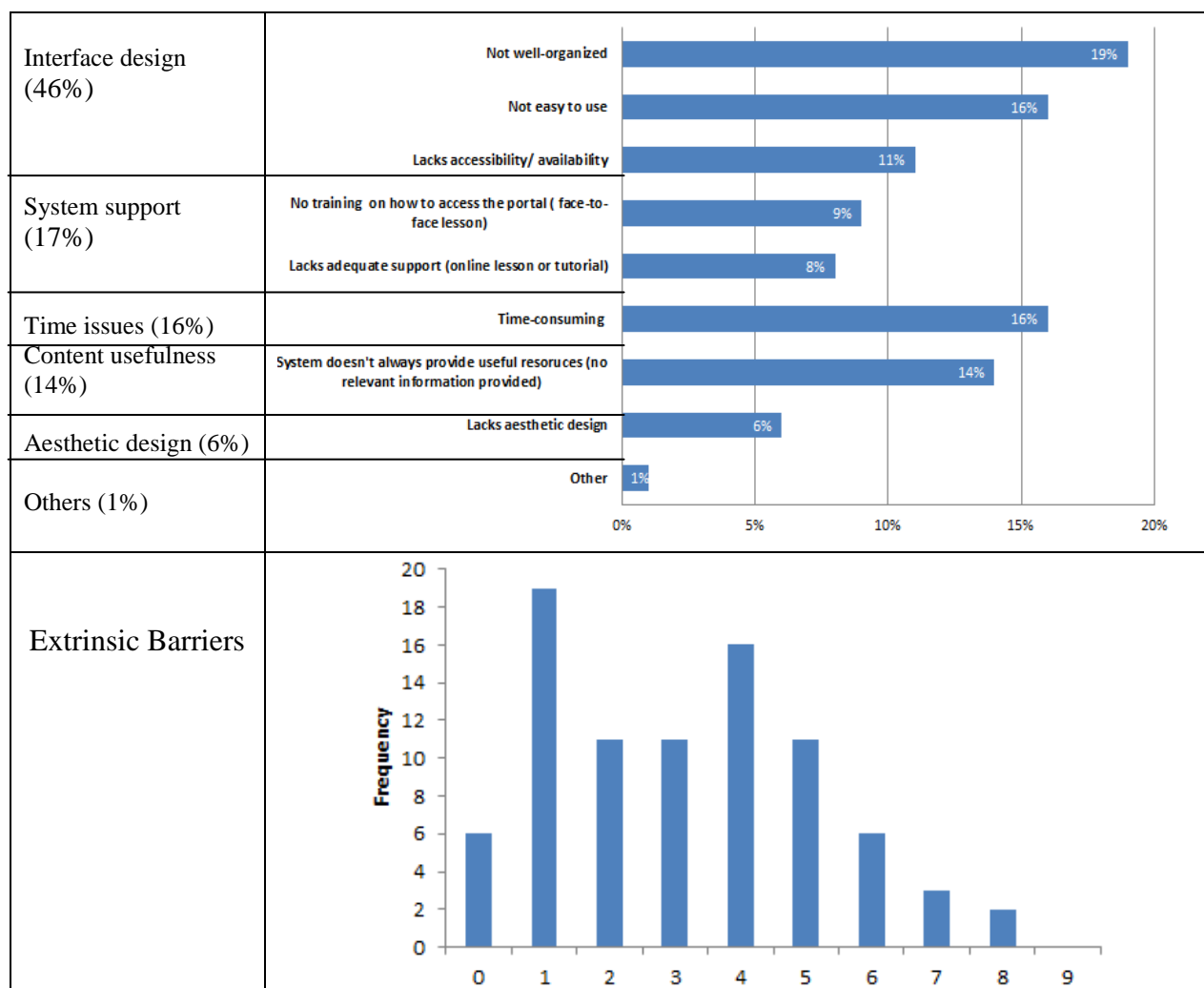


Table 4 shows the top barrier expressed by the participants is the interface design of the portals. Forty-six percent of them considered being well-organized with a user-friendly (easy to use) design as an important issue when they used educational portals. In particular, the barriers preventing participants from using educational portals were “not well-organized” (19%), “not easy to use” (16%), and “lacking accessibility/availability” (11%). Participants were then concerned with system support when they used educational portals: as 16% of them were concerned with lack of adequate system support, either face to face training courses (9%) or lack of online lessons or tutorials (8%). Participants were also concerned with how much “time” was consumed when they used educational portals, with 16% of participants expressing that it took too much time to learn the systems (time-consuming). Additionally, participants were concerned with content usefulness as 14% of them indicated that educational portals did not always provide useful/relevant information. However, the participants were less concerned about aesthetic design (6%) and/or other barriers that they encountered including “search result [are] not always directly related to teaching curriculum”, “portals do not provide specified content for different grade levels”, “amount of time it takes to find curricula [items] in the portal”, and “portals do not provide enough relevant information.” The bottom of Table 4 shows the distribution of the Extrinsic Barriers scores (counts) (mean is 3 and standard deviation is 2).

4.3.1.5 Participants' Intrinsic Barriers to Educational Portals

“Intrinsic barriers” is a count variable (0-9) created by summing the number of positive responses to Q25 on the Factory Study Survey. It is used in the Factory Study to measure barriers internal to the individual teachers.

Table 5. Descriptive Summary of Intrinsic Barriers

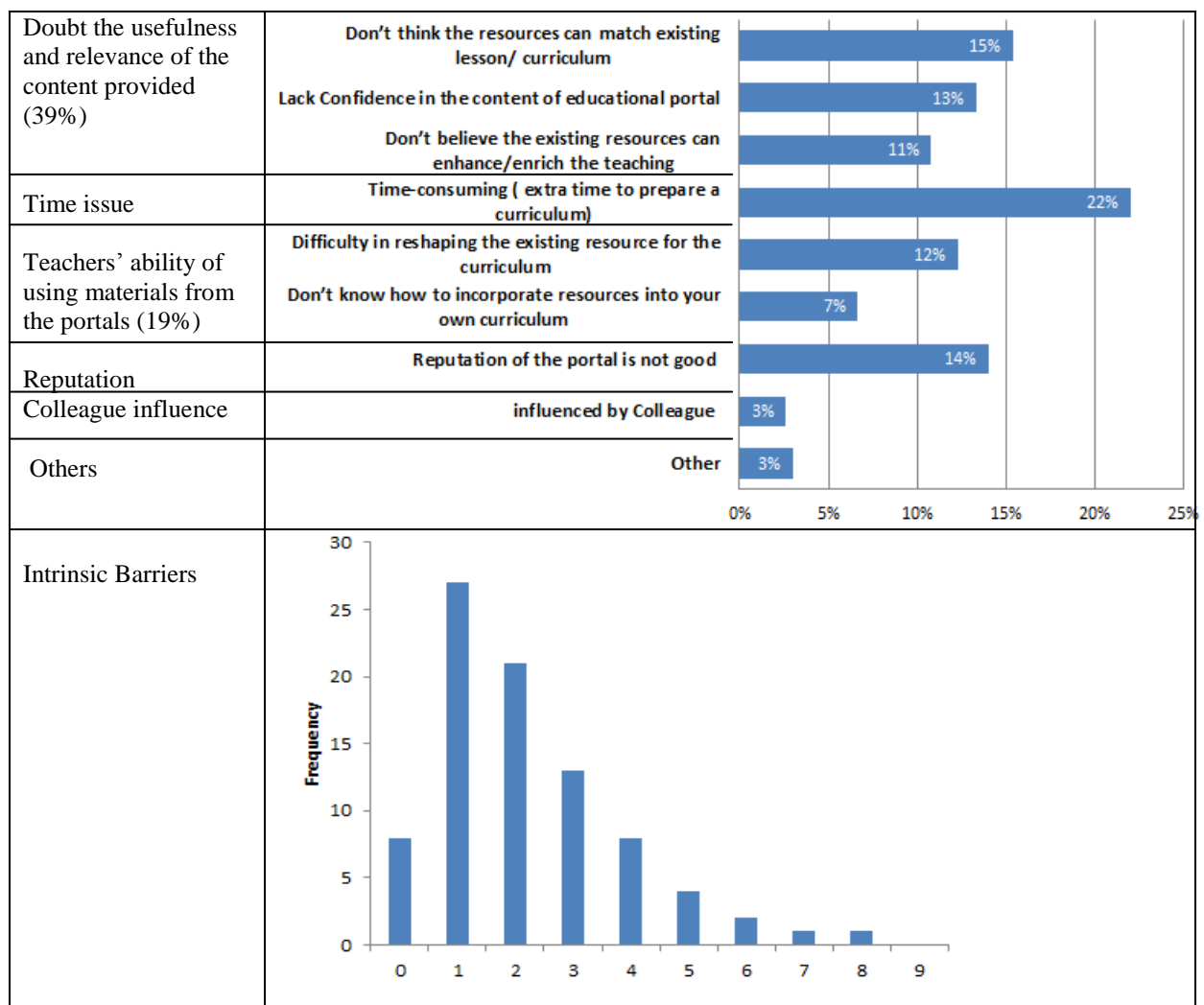


Table 5 shows that the top barrier expressed by the participants is that they doubt the usefulness and relevance of the content provided (39%). It includes 15% of participants who did not think that the existing resources could match their curriculum needs; 13% of them lacked confidence in the content of educational portals; and 11% did not believe that the existing resources could enrich their teaching process. Also, participants were concerned with spending “extra time” to use resources from educational portals, such as, 22% of the participants who reported that it was too time-consuming to incorporate resources from educational portals into their curricula. Also, participants’ competence in using materials from the portals should be considered. For example, 12% of the participants had difficulty reshaping the existing resources into their courses; and 7% did not know how to incorporate resources into their own curriculum. Additionally, 14% of the participants indicated that they did not use portals with poor reputations. However, lesser percentages of the participants (3%) were influenced by colleagues to use (or not use) materials. Other internal barriers were “...content lacking adaptability, and feel [it is] difficult to use resources from an educational portal.” The bottom of

Table 5 shows the distribution of the Intrinsic Barriers scores (counts) (mean is 2 and standard deviation is 2).

4.3.1.6 Participants’ Attitude towards Educational Portals

“Attitude” is a continuous variable created by performing a factor analysis on the responses to Q20, Q21, and Q22 from the Factor Study Survey. Its three components are 1) enjoyment of using educational portals, 2) comfort level in using them, and 3) intention to use resources from educational portals in lesson preparation.

Table 6 shows the participants’ attitudes towards using educational portals and the materials from the portals when they prepare their curriculum. This includes teachers’ personal preferences, comfort levels, and intentions to use materials found on educational portals.

Table 6. Attitude and Its Sources

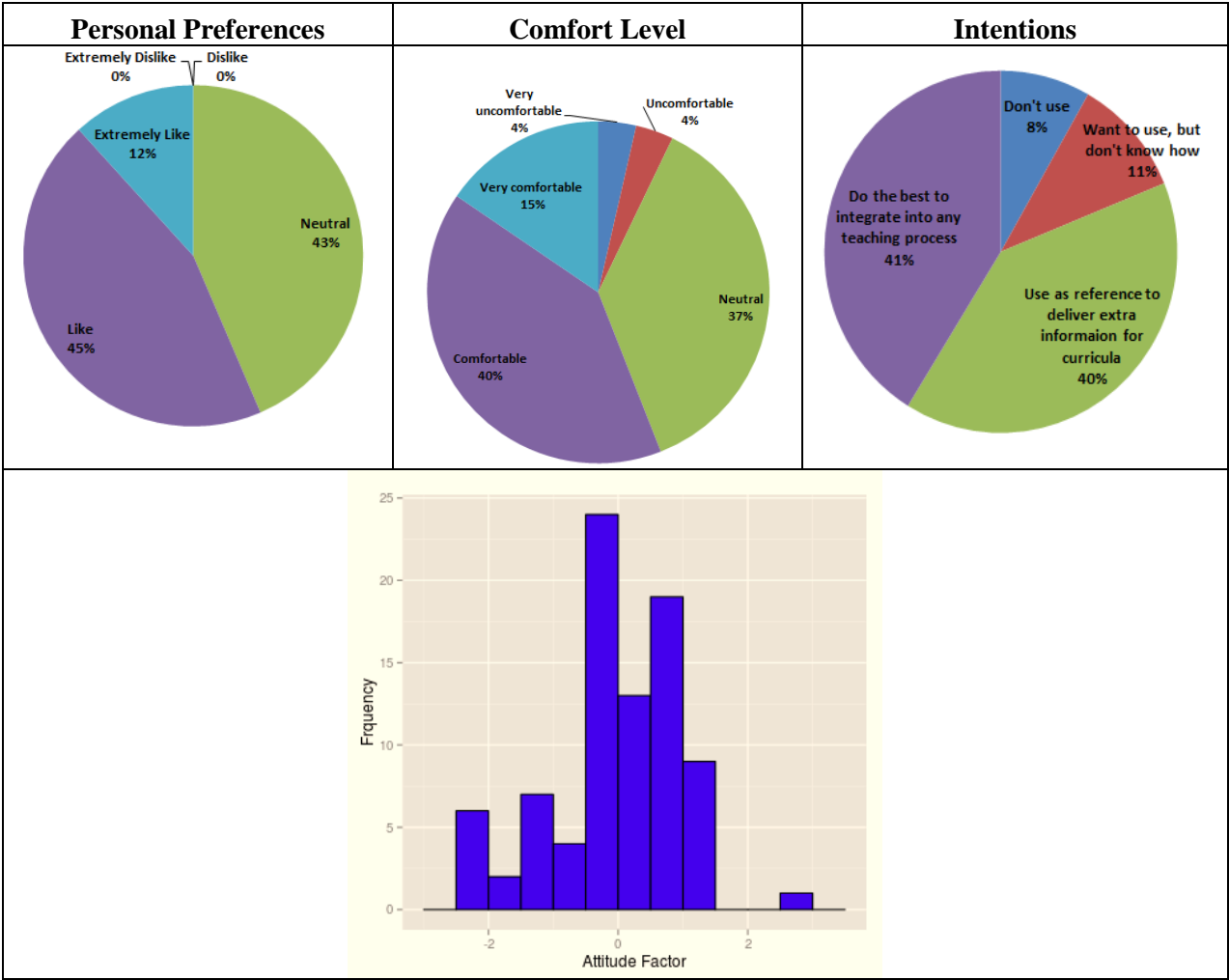


Table 6 also shows that no participant has a negative personal preference to adopt educational portals into teaching preparation. More specifically, 57% of the participants like to use educational portals to assist their teaching preparation (45% “like” and 12% “extremely like”); although 43% responded “don’t have a preference” or that they “neither like nor dislike” using educational portals. Fifty-five percent of the participants responded that they feel comfortable using educational portals to support teaching preparation (40% comfortable and 15% very comfortable), although still 6% feel uncomfortable with using educational portals.

For participants’ intention to use resources from educational portals in their curriculum, the results show that 41% of the participants tended to do their best to integrate the materials/resources from an educational portal into their teaching preparation and practices. Forty percent of the participants were willing to use resources for reference. However, approximately 20% of participants either “don’t know how to use” (11%) resources from educational portal or “don’t use” (8%) them.

Additional, Table 6 shows Attitude is the factor extracted from personal preferences, comfort levels, and intention to use by the factor analysis. Its distribution of sources factors (preferences, comfort levels, and intentions) and the distribution of the “Attitude” score range from -2.4 to 2.5 with a mean of 0 and standard deviation of 1.

4.3.1.7 Participants’ Information Needs

“Information needs” is a continuous variable created by performing a factor analysis on the responses to Q23 of the Factor Study Survey. It identifies the extent to which participants used educational portals to support their lesson preparation.

Table 7. Information Needs and Its Sources

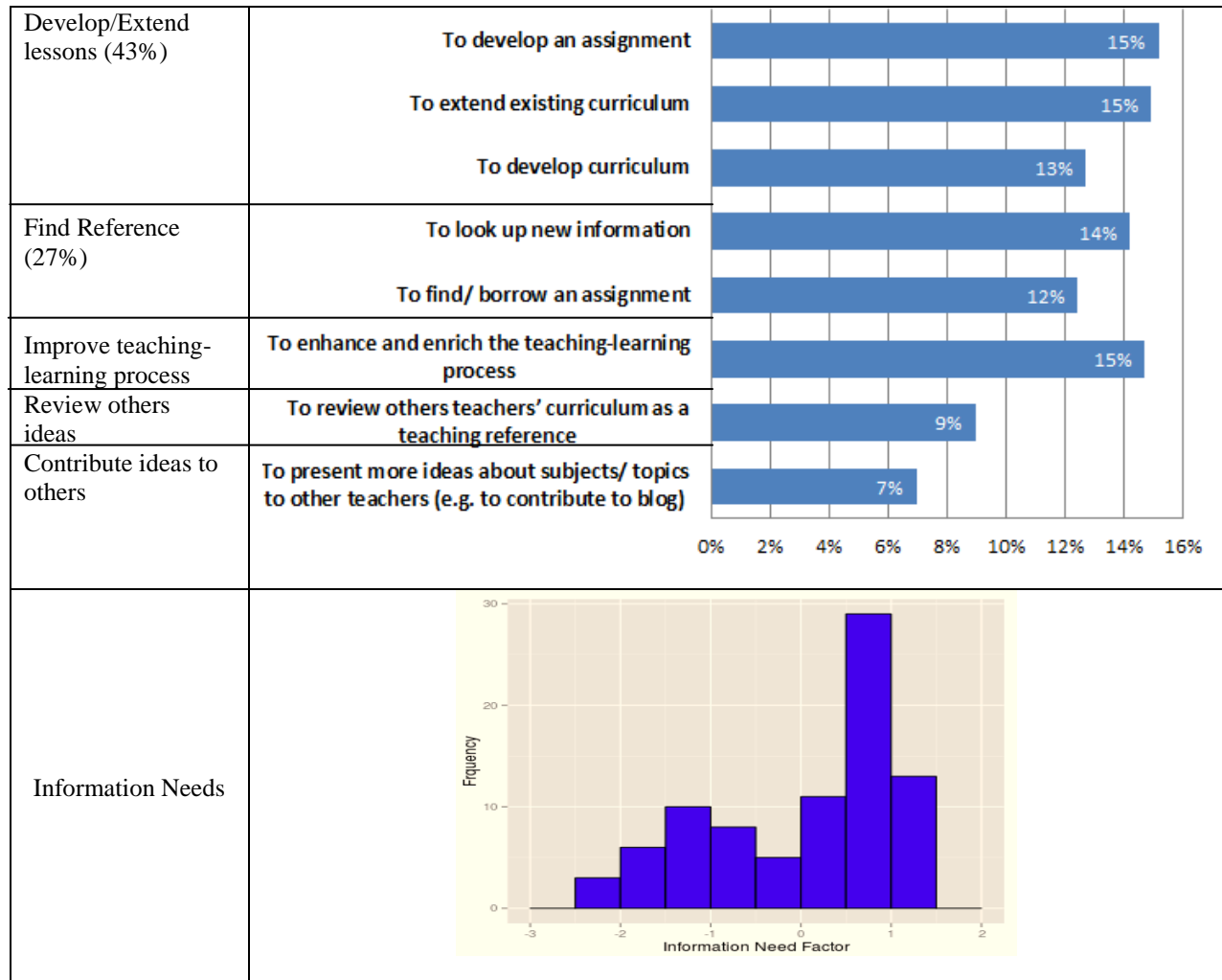


Table 7 shows the descriptive summary of the participants' information needs and its source variables. The results shows that 43% of the participants used educational portals for developing/extending curricula and assignments, in particular, 15% to develop an assignment, 15% to extend the existing curriculum, and 13% to develop curriculum. Twenty-seven percent of them indicated using educational portals in order to find/look up references, in particular, 14% to look up new information and 12% to find/ borrow an assignment. Also, 15% of the participants liked to improve their teaching-learning process. However, fewer participants liked

to review others' ideas (9%) and/or to contribute ideas about subjects to others (7%) in educational portals.

Additionally, Table 7 shows "Information needs" is the factor extracted from develop/extend lesson, find reference, improve teaching, review others' ideas, and contribute ideas to others by the factor analysis. "Information needs" scores range from - 2.3 to 1.3 with a mean of 0 and standard deviation of 1, and Table 7 also shows the distribution of sources factors and the distribution of the Information needs score.

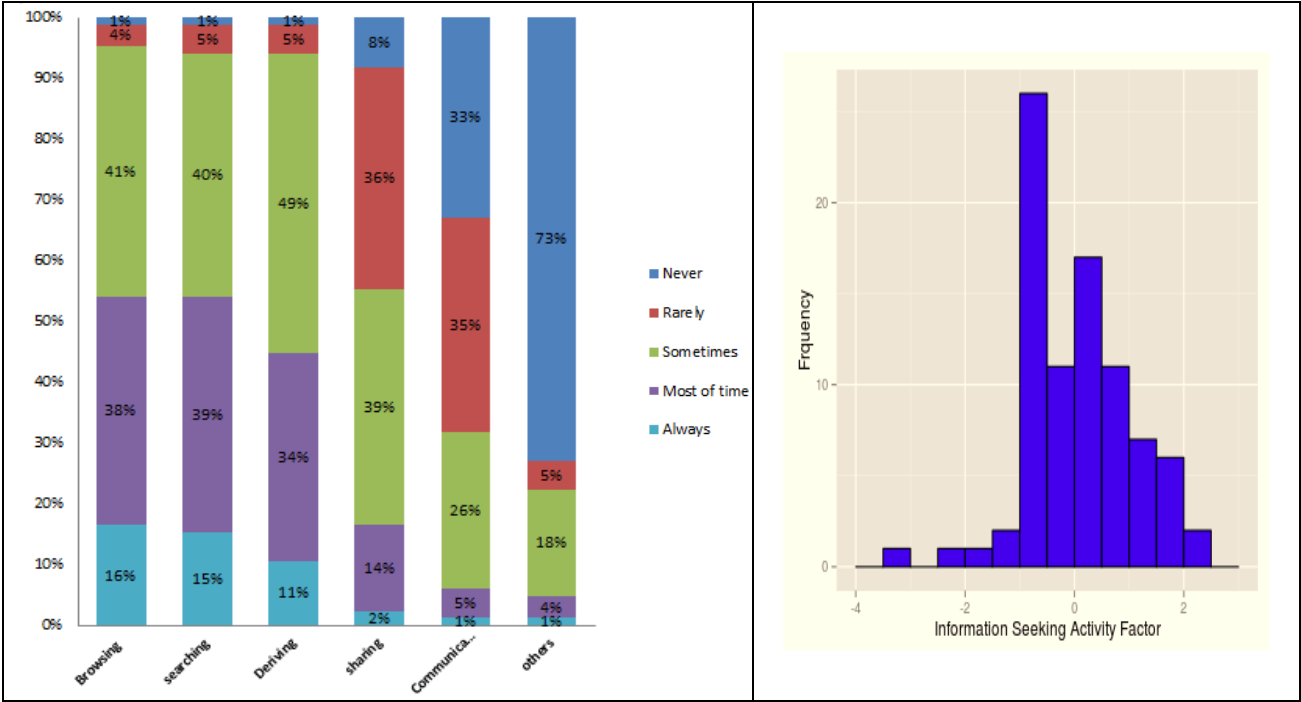
4.3.1.8 Participants' Information-seeking Activities

"Information-seeking activities" is a continuous variable created by performing a factor analysis on the responses to Q15 of the Factor Study Survey. This question is composed of 6 sub-questions using a 5 point Likert Scale. Table 8 shows the descriptive summary of the participants' information-seeking activities in using educational portals and its sources. The summary shows most participants liked to browse (54%), search/retrieve (54%), and derive (45%) teaching materials when they used educational portals. But less than 7% of them didn't browser/ search/retrieve through educational portals. However, a smaller number of them liked to share materials (16%) or to communicate with others (6%) through the portals. There were more 44% of them that did not like to share resources with others and 68% did not like to communicate with others through the portals. Twenty-eight percent of participants reported other miscellaneous information-seeking activities on the web.

"Information-seeking Activities" is the factor extracted from browsing, searching/retrieving, deriving, sharing and communicating (Q15) by the factor analysis. The

scores for “Information-seeking Activities” range from -2 to 1 with a mean of 0 and standard deviation of 1. Table 8 shows the distribution of sources factors and the distribution of the Information-seeking Activities scores.

Table 8. Information-seeking Activities and Its Sources



4.3.2 The Analysis for Research Questions

To answer the three sub-research questions (*RQ1-1*, *RQ1-2*, and *RQ1-3*), I used factor analysis to create the factor scores for TPACK, Attitude, Information needs and Information-seeking activities; linear models were used to analyze the relationship among the six important factors, participants’ information needs and information-seeking activities. The reason I ran the factor

analysis is because these variables are more complex concepts that cannot be directly measured with one question in the questionnaire. For example, the TPACK factor is a complex concept and cannot be measured by only asking one question. So, I performed factor analysis to construct a TPACK factor from knowledge of technology, pedagogy, and content. Before fitting linear models to further analyze the data, the study performs bivariate analysis to accurately select variables for the model.

4.3.2.1 Bivariate analysis (variable selection)

This section shows the bivariate analysis results to understand associations among the six factors' sub-components and to investigate what components should be considered in the final model (Figure 12). The grey boxes identify the six factors with sub-components list inside each factor. The lines between sub-components identify significant positive (+) or negative (-) correlations; where no sign exist the relationship was determined by a Fisher's Exact Test which indicates the probability of the relationship not positive or negative direction. The Fisher's Exact Test was used instead of Chi-square since the expected value of some of the cells was less than five which is the minimum value for the Chi-square test. This was used to test relationships between categorical variables, gender and degree, and the other variables. Table 9 also shows the Spearman correlation coefficients among the six factors' sub-components except for categorical variables, gender and degree. Since these remaining sub-components are ordinal variables, the Spearman correlation coefficient is the appropriate statistic. Note that Table 9 has more significant statistical results than Figure 12. Figure 12's results are based on the Fisher Exact Test which is the appropriate test in this situation; however, the Fisher Exact Test does not show

the direction of relationship (positive or negative) which Spearman correlation coefficient does provide.

Initially, the relationship among participants' background, prior technological experience, and other variables (technological knowledge, content knowledge, and pedagogical knowledge, extrinsic barriers, intrinsic barriers, personal preference, comfort level, and intention to use materials) was investigated. The results show the participants' years of teaching experience and prior experience using educational portals are associated with other factors: knowledge, barriers, and/or attitudes.

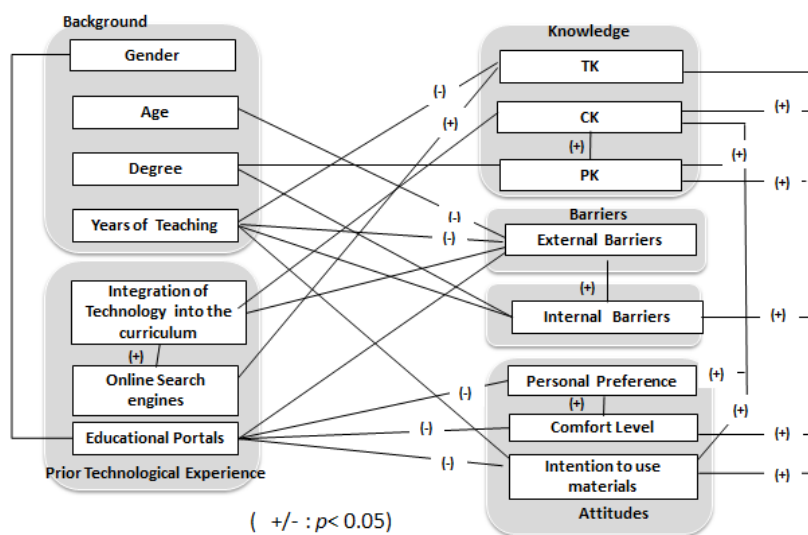


Figure 12. The Bivariate Analysis among Participants' Factors

More specifically, the participants' years of teaching are an important variable that connects to their technological knowledge ($p=0.02$), both extrinsic ($p<0.001$) and intrinsic barriers ($p=0.02$), and the intention to use materials from educational portals ($p=0.02$). Contrary to expectations, the participants' prior experience with using educational portals is negatively

associated with their TK ($r = -0.22$, $p=0.04$), personal preference ($r = -0.336$, $p=0.001$), comfort level ($r = -0.344$, $p<0.001$), and intention to use materials from educational portal ($r= -0.341$, $p=0.002$). It is interesting to see that the participants who have more experience in using educational portals show such a negative relationship towards educational portals. From the interviews in the Acceptance Study, this effect may have been caused by negative prior experiences.

Figure 12 and Table 9 show that the participants' educational degree was associated with pedagogical knowledge ($p<0.001$) and intrinsic barriers ($p=0.03$), while their prior experience of using technology to supplement teaching was associated with content knowledge ($p=0.05$). The participants' technological knowledge had a negative relationship with the years of teaching ($r=0.32$, $p<0.01$), and a positive relationship with prior experience with using online search engines ($r=0.27$, $p=0.01$). Also, participants who had higher technological knowledge had more intentions of using materials from educational portals ($r=0.32$, $p<0.01$) and were more comfortable using portals ($r=0.38$, $p<0.01$). Those who had higher content knowledge preferred to get more materials from portals ($r=0.32$, $p<0.01$) and had a personal preference to use portals ($r=0.28$, $p=0.01$). More specifically, the participants' knowledge of technology ($r=0.32$, $p<0.01$), pedagogy ($r=0.22$, $p<0.05$), and content ($r=0.32$, $p<0.01$) had a positive impact on their intention attitudes toward using materials from educational portals.

The participants' extrinsic barriers were associated with their age, years of teaching, and prior experiences with integration of technology into curriculum and using educational portals; meanwhile their intrinsic barriers were related to their education degree and years of teaching. Also, the older participants lacked confidence in their technological knowledge ($r = -0.31$, $p=0.05$); and there was a negative association between extrinsic barriers and age ($r = -0.33$,

$p < 0.001$) and extrinsic barriers and years of teaching ($r = -0.35$, $p < 0.001$). In addition, Figure 12 and Table 9 indicate that teachers' intention to use educational portals and the resources from portals are significantly affected by multiple variables - years of teaching; prior experience with using educational portals; knowledge of technology, pedagogy, and content; and extrinsic barriers. For example, there was a positive relationship between the participants' intention to use materials from educational portals and knowledge of technology ($r = 0.32$, $p = 0.003$), pedagogy ($r = 0.32$, $p = 0.0031$), and content ($r = 0.22$, $p = 0.05$).

Table 9. Spearman Correlation Coefficients among the Six Factors

Spearman Correlation Coefficients, N = 85 ; Prob > r under H0: Rho=0		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Age	1.00												
2	Years of Teaching	0.74 <.0001***	1.00											
3	Technology	-0.27 0.01**	-0.25 0.02*	1.00										
4	Online Search Engine	-0.08 0.46	0.003 0.98	0.31 0.004**	1.00									
5	Using Educational Portal	0.14 0.21	0.19 0.09	0.11 0.32	-0.09 0.39	1.00								
6	TK	-0.42 <.0001***	-0.30 0.005**	0.13 0.25	0.27 0.01**	-0.22 0.04*	1.00							
7	CK	-0.09 0.44	-0.02 0.87	0.00 1.00	0.12 0.27	-0.10 0.35	0.35 0.001* *	1.00						
8	PK	-0.12 0.27	0.08 0.49	0.07 0.50	-0.01 0.92	-0.05 0.66	0.22 0.04*	0.67 <0.001***	1.00					
9	Extrinsic Barriers	-0.33 0.002 **	-0.35 0.001***	0.03 0.81	0.11 0.32	0.05 0.68	0.21 0.05*	0.06 0.57	0.17 0.13	1.00				
10	Intrinsic Barriers	-0.16 0.14	-0.18 0.10	-0.04 0.70	0.03 0.76	0.04 0.69	0.26 0.02*	0.14 0.22	0.17 0.13	0.63 <0.001***	1.00			
11	Intention	-0.16 0.14	-0.14 0.22	0.13 0.25	0.03 0.81	-0.34 0.001***	0.32 0.003**	0.32 0.003**	0.22 0.05*	0.14 0.19	0.05 0.64	1.00		
12	Personal Preference	-0.18 0.10	-0.10 0.38	0.08 0.49	0.01 0.92	-0.34 0.002*	0.21 0.06	0.28 0.01*	0.25 0.02*	0.02 0.84	-0.02 0.82	0.46 <0.001***	1.00	
13	Comfort Level	-0.26 0.02*	-0.19 0.09	0.09 0.40	0.01 0.95	-0.34 0.001**	0.38 0.001***	0.20 0.07	0.07 0.51	-0.05* 0.62	-0.03* 0.78	0.42 <0.001***	0.57 <0.001***	1.00

p≤0.05*; p≤0.01**; p≤0.001***

4.3.2.2 RQ1-1 results

Many studies have indicated that participants' attitudes, barriers and TPACK are affected by personal characteristics (background and prior technological experience when they integrate technology into classroom). To confirm the *RQ1-1*, this study conducted a factor analysis to measure these factors (TPACK, Attitude, Extrinsic Barriers and Intrinsic Barriers) before fitting linear models to further analyze the data. TPACK is constructed from technological knowledge, pedagogical knowledge, and content knowledge into one factor (Cronbach's $\alpha=0.7$); and "Attitude" is constructed from personal preferences, comfort level and intention to use materials from educational portals (Cronbach's $\alpha=0.71$). Factor analysis of "Extrinsic Barriers" and "Intrinsic Barriers" failed to meet Cronbach's α level (0.7). Therefore, Extrinsic Barriers (mean=3; std dev=2) and Intrinsic Barriers (mean=2; std dev=2) are the number of positive responses in Q24 and Q25, respectively.

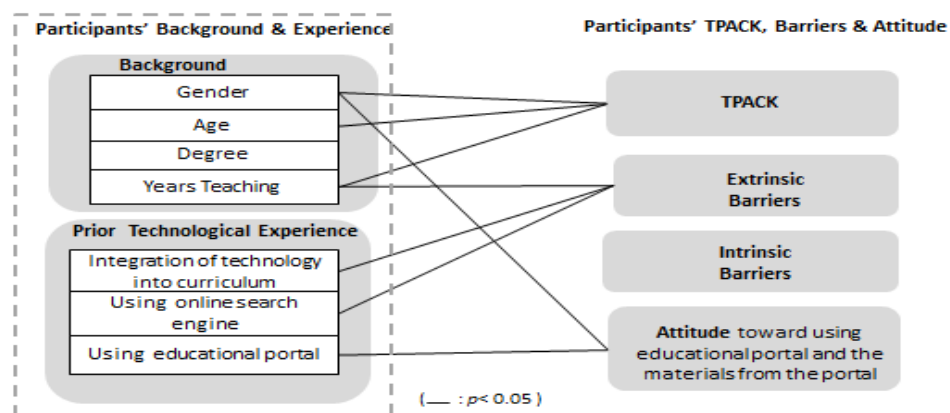


Figure 13. The Linear Model between Background and Experiences and other Four Factors

To understand the relationship among the six factors, a multivariate analysis was performed in this study. Figure 13 (above) shows the results of the linear models to examine the relationship between the participants' TPACK, Extrinsic Barriers, Intrinsic Barriers and Attitude (as the dependent variable in the linear models) and Background and Prior Technological Experiences' sub-components. Figure 13 shows that the participants' gender ($p=0.02$), age ($p=0.04$), and years of teaching ($p=0.03$) are significantly related to TPACK; and years of teaching ($p=0.05$) and prior experience integration of technology into curriculum and using online search engine ($p=0.05$) are significantly related to Extrinsic Barriers. Also, gender ($p=0.04$) and prior experience using educational portals ($p<0.01$) affect attitudes toward educational portals. The result found is that teachers' background and prior technological experiences have a significant relationship on TPACK, Extrinsic Barriers and Attitude, but not on Intrinsic Barriers.

Figure 14 (below) is the linear model which examines the relationship between the participants' characteristics (i.e. background, prior technological experience and TPACK as Independent variables) and Extrinsic Barriers, Intrinsic Barriers and Attitude (as the dependent variable in each linear model). The results show that the participants' Extrinsic Barriers are affected by the years of teaching ($p= 0.01$), and three sub-components of prior technological experience (integration of technology into curriculum ($p=0.01$), using online search engines ($p=0.03$) and using educational portals ($p=0.04$)). Also, the participants' attitudes are impacted by gender ($p=0.03$) and prior experience using educational portals ($p<0.01$). So, the result indicated that the teachers' characteristics affect their extrinsic barriers and attitudes toward using educational portals, but not their intrinsic barriers.

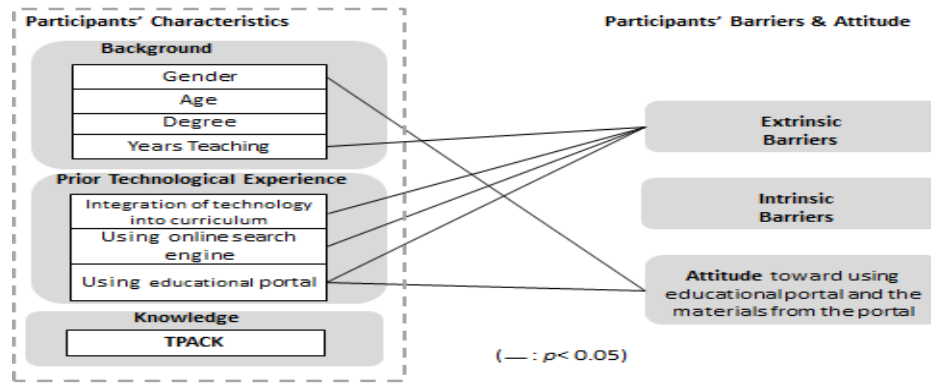


Figure 14. The Linear Model between Participants' Characteristics and other Three Factors

Figure 15 (below) is the linear model that examines the relationship between participants' Attitude (as dependent variable) and their characteristics, Extrinsic Barriers, and Intrinsic Barriers (as independent variables). The results show that the participants' Extrinsic Barriers ($p=0.05$) and Intrinsic Barriers ($p=0.01$) are related to their attitudes toward using educational portals, as well as the participants' gender ($p=0.04$) and prior experience of using educational portals ($p=0.01$).

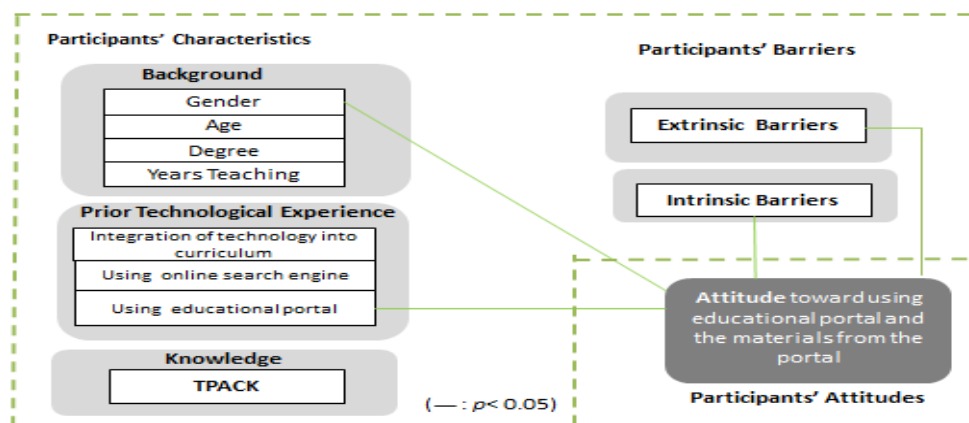


Figure 15. The Linear Model between Participants' Attitude towards Using Educational Portal and Their Characteristics, Extrinsic Barriers, and Intrinsic Barriers

In summary, the relationships among the various factors are: (1) participants' TPACK, Extrinsic Barriers, and Attitude are significantly influenced by gender, age, years of teaching and prior technological experiences – integration of technology into curriculum, use of online search engines, and use of educational portals; (2) participants' characteristics (specifically, gender, years of teaching, and prior technological experiences) are related to Extrinsic Barriers and Attitude toward using educational portals, but not Intrinsic Barriers; and (3) participants' gender, prior technological experience using educational portals, and both Extrinsic and Intrinsic Barriers are major factors that impact on their Attitude toward using educational portals.

4.3.2.3 RQ1-2 results

RQ1-2 (when using educational portals, are teachers' information needs affected by these various factors?) aims to understand the relationship between the participants' information needs and the six factors, the study applied a linear model to this question. This study also conducted a factor analysis on the participants' information need questions in order to create a single factor that measures the participants' information needs. The reliability of Information Need, as a factor, is acceptable (Cronbach's Alpha = 0.7). The result (Figure 16) shows that there is no significant difference between the participants' Information Need and personal characteristics, Intrinsic Barriers and Attitude. However, the participants' Information Need has a relationship with Extrinsic Barriers ($p < 0.01$) and Attitude toward using materials from educational portal ($p < 0.01$).

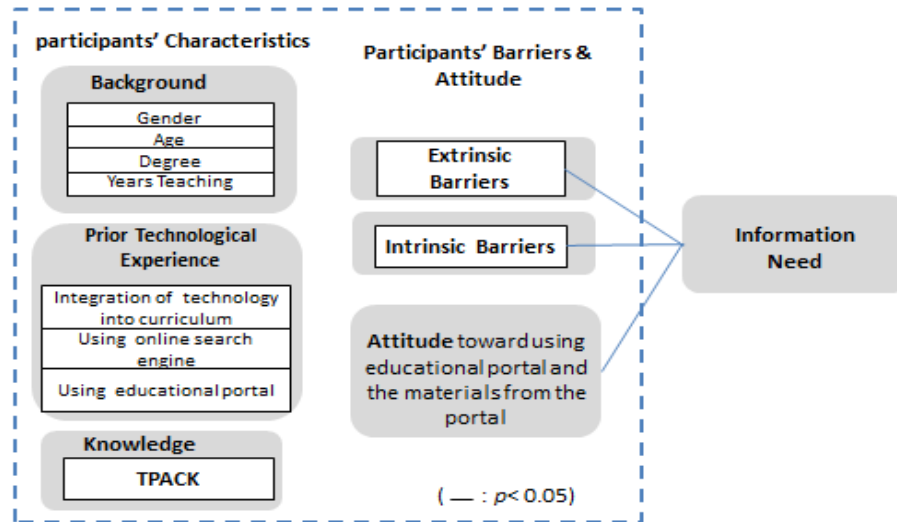
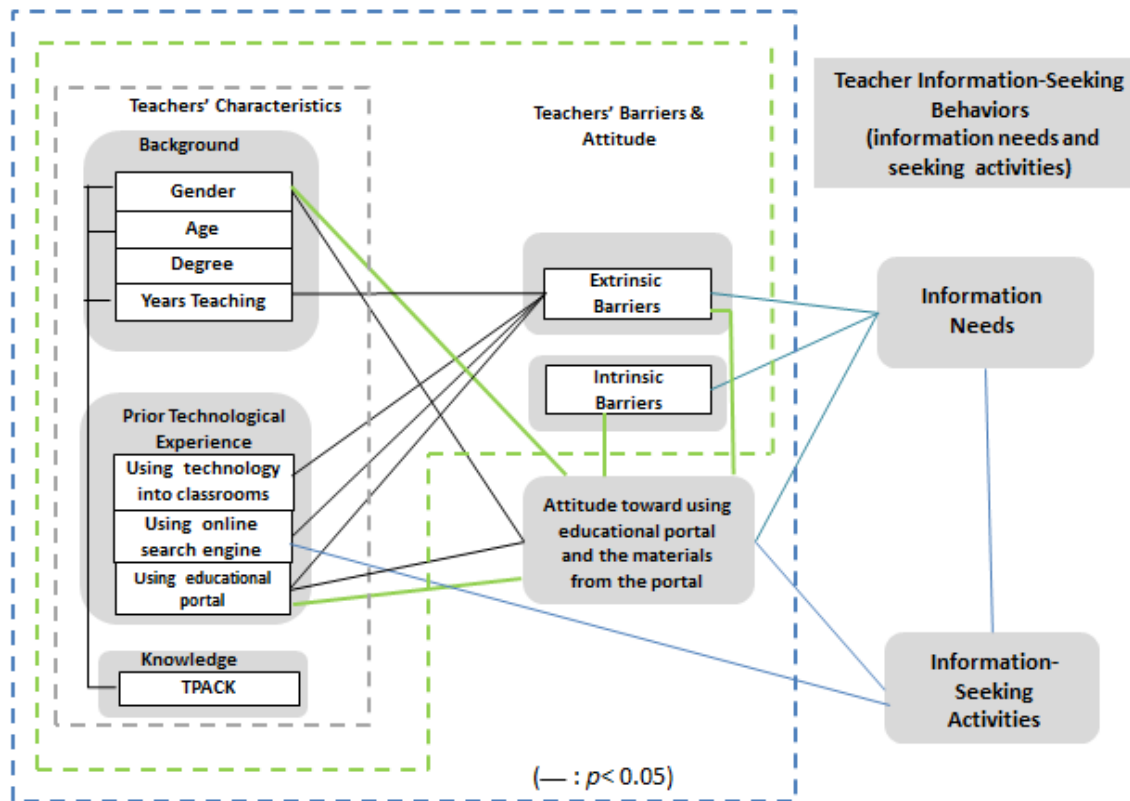


Figure 16. The Relationship between Participants' Information Need and the Six Factors

4.3.2.4 RQ1-3 results

To understand the relationship between participants' six factors and their Information-seeking Activity, this study first conducted a factor analysis on the participants' information-seeking activities questions (Browsing, Searching/Retrieving, Deriving, Sharing, and communicating) in order to create a single factor that measures the participants' Information-seeking Activities. The reliability of Information-seeking Activities, as a factor, is acceptable (Cronbach's Alpha=0.8). To further answer the *RQ1-3*, it applied a linear model to show association between each factors and Information-seeking Activities when participants used educational portals. Figure 17 (below) shows that the participants' prior technological experiences of using online search engine ($p=0.002$), and attitudes ($p=0.01$) have an impact on the information-seeking activities when they use educational portals.



- **Inner grey colored lines** show the significant relationships among teachers' Extrinsic Barriers, Intrinsic Barriers, Attitude, and characteristics (i.e. background, prior technological experiences and TPACK) and
- **Middle green colored lines** show whether teachers' Attitude is affected by other factors (i.e Extrinsic Barriers, Intrinsic Barriers, Background, Prior Technological Experience and TPACK)
- **Outside blue colored lines** show the significant relationships among teachers' information-seeking behaviors and the six factors.

Figure 18. The Results of the Factor Study

There are three major results from the Factor Study. First, teachers' demographic and prior technological experiences affect their TPACK, barriers and attitudes; and teachers who have higher knowledge of technology, pedagogy, and content have a positive attitude toward using materials from educational portals. However, when we are concerned with other factors together, the results show that TPACK does not directly affect teachers' attitude and information-seeking behaviors (i.e. Information Need and Information-seeking Activity). Second, teachers' Extrinsic and Intrinsic Barriers have a strong interrelationship and they can

affect K-12 teachers' Information Need and Attitude toward using educational portals but not directly influence their Information-seeking Activity. Third, teachers' attitude toward using educational portals is significantly associated with their background, Extrinsic Barriers, Intrinsic Barriers, Information Need, and Information-Seeking Activity. In other words, among the six factors, teachers' attitudes are a major factor in determining their information-seeking behaviors, and whether or not they will use educational portals. As Ertmer et al.(2012) indicated, teacher's attitudes about integration of technology have the biggest impact on their teaching design.

Beyond the outcome evident in Figure 18, the descriptive statistical results also found that these barriers can prevent teachers' information needs and information seeking activities from using educational portals: time limitation, teachers' self-efficacy (lack believe or confidence), teachers' feelings of portal usefulness and ease of use, the interface design and content quality (relevant/usefulness resources) of educational portals (see Table 4 and

Table 5) . Thus, these barriers should be considered when analyzing whether teachers' accept or reject using education portals as information resources into their lesson preparation.

4.4.2 Limitation of Study

There are several limitations in this study. First, most of the participants from the NCTA group majored in Education or Arts and Sciences; and the majority teach history and social science courses in K-12 schools. Thus, we need participants in various other fields to understand teachers in general. Second, participants were all locally recruited which could have introduced a bias. Since NCTA spans the country, participants could have been recruited from a larger geographical area. Third, teachers' self-report of TPACK in the study may generate bias since teachers could over or under estimate their TPACK capability. So it could have been better if I

also had conducted interviews, which would have helped us to get more detailed information/data about teacher's Information Need and Information-seeking Activity in using an educational portal.

4.5 IMPLICATION

The Factor Study examines whether the K-12 teachers' Information Need and Information-seeking Activity are influenced by teachers' background, Prior Technological Experience, Extrinsic Barriers, Intrinsic Barriers, and Attitude toward integrating educational portals as information resources to support their lesson preparation. It is based on Task Complexity which is the concept of a loop of task perceived by the user, influenced by user's personal factors and situational factors which influenced the user's information needs and information-seeking activities (Case, 2008).

The results show that the major reasons for K-12 teachers use educational portals is to prepare instructional materials (i.e. to development an assignment and extend existing curriculum, to enhance the teaching-learning process) and to look up new information by browsing and searching on the portals. Chiero (1997) indicated that the major reasons for teachers to use computer technology are to prepare instructional materials and to look for information in a particular subject area.

The results show that a K-12 teacher's attitude is a major factor impacting one's information seeking behaviors when s/he seeks information from educational portals to be incorporated into the course design. Usun (2009) and Sahin-Kizil (2011) stated that teachers' attitude is a significant factor (as a major predictor) in the implementation of ICT integration in

education. Pynoo et al. (2011) stated, “Attitude is an antecedent to behavioral intention, while the latter serves as antecedent to use” (p. 2).

In addition, the results show that teachers’ extrinsic and intrinsic barriers play an important role in teachers’ Attitude, Information Need, and Information-seeking Activity. More specifically, these barriers would prevent K-12 teachers from making more and better use of educational portals. For example, teachers are concerned with personal competence (such as how to incorporate resources into lessons), time consumption (needing extra time to operate educational portals and to prepare lesson if using portals), interface design (whether the portals are accessibility, well-organized, and easy to use), and content quality (usefulness/relevance) on the portals. Fu (2013) indicated that teachers’ barriers would affect their effective integration of technology. Thus, the way that educational portals address the above barriers, as well as teachers’ personal web competence, and teachers’ feelings of portal usefulness and ease of use should also be considered as critical issues for teachers using educational portals. However, teachers’ TPACK is not an important factor that influences teachers’ information-seeking behaviors for lesson preparation in educational portals according to my Factor Study.

The next study of this dissertation is the Acceptance Study that scrutinizes whether teachers’ barriers (extrinsic and intrinsic) influence their attitudes toward using educational portals as information resources for professional enrichment (professional learning). The teachers’ information-seeking in electronic environments (e.g. the portal of East Asia Gateway for Linking Educators (EAGLE) and four other educational portals) will be considered as the study platforms.

5.0 FINDINGS AND DISCUSSIONS OF THE ACCEPTANCE STUDY

5.1 INTRODUCTION

This chapter reports on and discusses the findings of the Acceptance Study. The goal of the Acceptance Study is to explore what variables influence K-12 teachers to accept and actually use educational portals; in order to assist in the development of a model that benefits educators and instructional technologists to build effective educational portals and to meet teachers' specific needs when they seek information in support of teaching preparation. I used Davis' Technology Acceptance Model (TAM) as the basic model (see section 1.3.2) merged with five variables (Teachers' Computer Self-efficacy (TCS), Time Issues, Social Influences, System Interface and Content Quality) to fully explore what affects K-12 teachers' usage and acceptance (measured by Perceived Usefulness and Perceived Ease of Use) of educational portals. These five variables were included because they were found to be important during the literature review and were factors identified from the Factor Study; they are defined in Section 1.6.

This study has two parts, Acceptance Study Part 1 which consisted of an online survey and a one-on-one interview (Acceptance Survey) and Acceptance Study Part 2 which consisted of a one-on-one interview (Self-efficacy Survey). It was analyzed using a mixed-methods approach which included descriptive statistics, appropriate statistical tests (Fisher's Exact Test), and content analysis to answer the research questions as outlined in Section 3.2. The main

Research Question (RQ) of this study is: What variables influence K-12 teachers' acceptance of educational portals as information resources for their lesson preparation? The five specific research questions are as follows:

- *RQ2-1*: How do different K-12 teachers' backgrounds affect their acceptance of educational portals?
- *RQ2-2*: a) Which variables influence K-12 teachers' acceptance and actual use of educational portals, in general, as information resources for lesson preparation?
b) Does teachers' acceptance of EAGLE as an information resource differ from their acceptance of other educational portals? The variables considered are Teachers' Computer Self-efficacy (TCS), Time Issues, Social Influences, System Interface, and Content Quality.
- *RQ2-3*: Is teachers' information-seeking behavior significantly related to their acceptance of and actual usage of educational portals?
- *RQ2-4*: What interface functions support K-12 teachers' use of educational portals as information resources for lesson preparation?
- *RQ2-5*: Whether Teachers' Computer Self-efficacy (TCS) should be considered as an important variable that influences K-12 teachers' acceptance and actual usage of portals?

5.2 THE FOCUS OF THE ACCEPTANCE STUDY

To answer these research questions, the focus of the Acceptance Study is to understand whether two dependent variables from Davis' Technology Acceptance Model (TAM) are linked with the five identified variables in order to understand K-12 teachers' acceptance of educational portals. The important dependent variables in Davis' TAM are Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness is a variable for evaluating whether teachers think that computer

technology (particularly educational portals) enhance their teaching performance; and Perceived Ease of Use reflects whether teachers feel that using the portal is worth the effort (e.g. easy to learn, use, access, and interact with). Perceived Usefulness and Perceived Ease of Use are based on two distinct sources: responses to Q13 and Q14 of Acceptance Survey and Content Analysis of the Acceptance Interview (Q7 and Q10). The five variables are based on the literature review of technology acceptance (see Section 2.1.2) and the findings of my Factor Study (see Chapter 4). The following is a brief definition of each variable used in the Acceptance Study.

- *Teachers' Computer Self-efficacy* (TCS): this variable is borrowed from Compeau and Higgins' (1995) three dimensions of computer self-efficacy that are: (1) Teachers' Computer Self-efficacy Strength (TCSS) – whether teachers feel confident to perform various tasks or, inversely, feel anxiety, stress, etc. about performing technological tasks; (2) Teachers' Computer Self-efficacy Generalizability (TCSG) – whether teachers have abilities in different domains of computer technology and/or willingness to use new systems; and (3) Teachers' Computer Self-efficacy Magnitude (TCSM) – whether teachers feel capable of accomplishing difficult computer tasks. The main data sources for these variables are the Self-efficacy Interview, Q1 to Q11 – the entire survey, and are extracted via content analysis. Additionally, Q7 and Q10 of the Acceptance Interview provided data for content analysis. They are binary variables which indicate whether the participant displays confidence in the particular sub-element of computer self-efficacy or not (ambiguous responses are coded as neutral rather than positive or negative).
- *Time Issues*: this variable includes two sub-elements: (1) “Time Consuming” indicates whether K-12 teachers feel that it is too time consuming to search for information through educational portals, (2) “Time Constraints” indicates whether K-12 teachers feel

that too much extra time is needed to incorporate information resources from portals into lesson preparation. They are included to evaluate whether time influences K-12 teachers' attitudes toward using the educational portals. In Q7 and Q10 of the Acceptance Interview, if the participants mentioned either time consumption or time constraints, the appropriate variable is marked as positive, if not then negative, and there were no ambiguous responses to time issue questions.

- *Social Influences*: These real-world conditions come from my literature review and emerged from the responses of teachers that included (1) Subject Norms (whether teachers' use of educational portals are influenced (or not) by students, colleagues, and/or principals), (2) Curriculum Setting (whether the school/state curriculum arrangement affects teachers' acceptance of educational portals), and (3) Technological Support (whether schools' technological support affects teachers). They are included to understand whether these real-world conditions existing for K-12 teachers affect their acceptance of educational portals. The data source for these three variables is the results of content analysis on Q7 and Q10 of the Acceptance Interview.
- *System Interface*: This variable includes 8 sub-elements – (1) quantity of information presented, (2) grouping and highlighting of information, (3) screen standardization, (4) usage of multimedia elements (e.g. pictures, diagrams, videos, and sound), (5) navigability, (6) explanations, (7) communication channels, and (8) feedback (concepts borrowed from Kaur and Baba (2006)). The Acceptance Study asked teachers to self-report their experiences with the interfaces of any general educational portal, EAGLE, and four other selected educational portals in order to understand whether the *System Interface* provided by the portals would influence their acceptance. Source data for these

variables comes from the Acceptance Survey, Q15 to Q24, and from the content analysis of the Acceptance Interview, Q7 to Q12.

- *Content Quality*: This variable includes 3 sub-elements – (1) the relevant content/resources (whether the system provides various relevant resources e.g. Books, Journal articles, CDs, DVDs, images, and/or other relevant documents), (2) content sharing capabilities (whether the system provides the capabilities for teachers to share their experiences of using content from portals in their classrooms), and (3) content organization (whether the system integrates high quality content or distinguishes high quality information from possibly mere subjective opinions). These variables are included to evaluate the relevance of content and the quality of resources that the portals provided. The sources for the data are from the content analysis of the Acceptance Interview, Q7 to Q12.

5.3 RESEARCH FINDINGS

This section presents descriptive statistics, the results from Fisher's Exact Tests, and content analysis to answer the research questions.

5.3.1 Descriptive Statistics

The descriptive statistics summarize the results from the online questionnaire. Consisting of the participants' demographics, the participants' previous experiences using ICT (i.e. internet access, computer ability, the frequency of using online search engines, using educational portals, using

the specific portal: EAGLE), the participants' information-seeking behavior on EAGLE, and the participants' acceptance of educational portals via Perceived Usefulness and Perceived Ease of Use.

5.3.1.1 Demographics

All 14 of the participants who took part in the Acceptance Survey were from my Factor Study. However, only 12 of them fully completed the online questionnaire and the first one-on-one interview (Table 10). Respondents included 8 females (67% of the sample) and 4 males (33% of the sample). The largest age group of participants was between 30 to 39 years old (5 teachers, 42%). For the participants' educational degree, 83% held a Master's degree or higher. The distributions of the participants' specific background were elementary teachers (17%), librarians (17%), principals (17%) and art & social science teachers (50%). The principals and librarians were also teaching and replied to the survey questions in their role as teachers (i.e. questions focused on their lesson preparation practices when teaching grades K-12). The participants' teaching subjects included arts, history and social studies (60%), as well as sciences and others such as math, geography and gifted (40%). Over 58% of the participants had more than 10 years of teaching experience with 42% reporting 15-24 years, 17% reporting over 25 years of classroom experience. The majority of participants (67%) taught at the high school level in grades 9-12.

In the Self-efficacy Survey, only 7 participants continued to take part in the interviews, which included 4 females and 3 males. The largest group of the participants was also between 30-39 years old with a Master's degree who had more than 10 years of teaching experience. The majority of the participants taught in grades 9-12.

Table 10. Participants' Backgrounds (Acceptance Study)

		<u>N=12</u>	<u>%</u>	<u>N=7</u>
Gender	Male	4	33%	3
	Female	8	67%	4
Age	≤ 29	1	8%	1
	30-39	5	42%	4
	40-49	2	17%	1
	50-59	2	17%	1
	60 +	2	17%	0
Degree	Bachelor	2	17%	1
	Master	8	67%	5
	PhD.	2	17%	1
Years of Teaching	1-5	2	17%	2
	6-9	3	25%	1
	10-14	2	17%	1
	15-24	3	25%	2
	25+	2	17%	1
Grade teach	PK-4	4	33%	1
	5-8	0	0%	0
	9-12	8	67%	4
Specific background	Principal	2	17%	1
	Librarian	2	17%	0
	Elementary Teacher	2	17%	1
	Social and Sciences studies	6	50 %	5
Subject taught	Fine Arts	3	7%	1
	Language Arts	4	9%	0
	Social Studies	9	20%	4
	History/Culture	6	13%	4
	Global Studies	3	7%	2
	Special education	2	4%	0
	General Science	2	4%	2
	Math	4	9%	1
	Geography	6	13%	2
	Library	2	4%	0
	Gifted	4	9%	1

5.3.1.2 The participants' experiences in using ICT

This section reports the participants' previous ICT experiences including Internet access, the participants' computer ability, the frequency of use of and the advantage of online search engines, general educational portals, and EAGLE.

(1) Internet access:

Almost all the participants reported that they had Internet access available with high speed either from school or home. Only one participant (N=1) had no high speed internet at home. The data source was Q7 from the Acceptance Survey.

(2) Teachers' computer ability:

The participants stated that they were satisfied with their abilities when they addressed various computer issues (e.g. downloading/uploading, installing programs/plugin-ins) in a web-based environment. More specifically, 75% of the participants were satisfied with their own abilities when using web-based environment to find resources for lesson preparation. However, still 25% of them remained indifferent (neutral). The data source was Q8 from the Acceptance Survey.

(3) The frequency and the advantages of using online search engines and educational portals:

A. The frequency of using ICT: All the participants indicated that they had experience using online search engines and educational portals when they conducted their lesson preparation. However, they had different use frequencies with different ICTs (Table 11).

Table 11. Participants' ICT Usage (Acceptance Study)

	Online Search Engines		General Educational portals		EAGLE		
	Freq.	%	Freq.	%		Freq.	%
Never	0	0%	0	0%	This is my first time	0	0%
Less than once a week	0	0%	9	75%	Once per semester	9	75%
A few times per week	5	42%	1	8%	Once a month	2	17%
At least once per day	3	25%	1	8%	Once a week	1	8%
Many times per day	4	33%	1	8%	Once a day	0	0%

The following explained the participants' different ICT usage. The result showed that no one used public online search engines less than once a week. In particular, 42% of the participants used online search engines a few times per week, 25% used at least once per day, and 33% used them many times per day. But, 75% of the participants mentioned they used educational portals less than once a week, and the other usage categories (i.e. use a few times per week, at least once per day, and use many times per day) had 8% each. Moreover, 75% of the participants only visited EAGLE once per semester, 17% visited once a month and only 8% visited once a week. The data source was Q9, Q11, and Q15 from the Acceptance Survey.

B. The advantages of using ICT: The main benefit for these participants for using ICT was Perceived Usefulness. But, when only considering educational portals, the participants considered Content Quality to be the main benefit (the data source for the advantages of using general online search engines was Q10 from the Acceptance Survey, for general educational portals was Q12, and for EAGLE as the portal was Q22. The following results are the advantages of using each.

C. Table 12 shows the data source for the advantages of using general online search engines was Q10 from the Acceptance Survey, for general educational portals was Q12, and for EAGLE as the portal was Q22. The following results are the advantages of using each.

Table 12. The Advantage of Using ICT

	Online Search Engines	General Educational portals	EAGLE
Perceived Usefulness	N=6; 50%	N=6; 50%	N=6; 50%
Perceived Ease of Use	N=5; 42 %	0	0
Time Issue	N=3; 25%	N=1 ; 8.33%	0
Content Quality	N=3; 25%	N=7; 58%	N=9; 75 %
Social Norm	0	0	N=2 ; 16.67 %

(a) The advantages of using online search engines

The benefits the participants identified for using online search engines were Perceived Usefulness, Perceived Ease of Use, Time Issue, and Content Quality. First, *Perceived Usefulness* – 50% of the participants (N=6) thought online search engines (e.g. Google) could serve as a good starting point to search for pertinent resources as references to support teaching and provided information to help teachers create their own curriculum/lesson. For example, participants said “there is so much information available on the web... I can use for my curriculum (No. 1)”, “online search (e.g. Google) can serve as a good starting point to search (No. 6),” “online search engines allow me to get pertinent resources in a timely manner (No. 7),” and “online search engines (No. 3) help me to find links that I can use for students/tutorials for teaching and images for students to use as reference”, (No. 8) “help me to find materials for supporting the lessons that I teach, and usually give me ideas for lesson preparation”. Second, *Perceived Ease of Use* – 42 % of the participants (N=5) stated that online search engines were

able to help people quickly and easily uncover resources that are published or viewed by other teachers (mentioned by participants No. 2, No. 9, No. 10, and No. 12). Third, *Time Issue* – 25% of the participants (N=3) were concerned with time issues and believed that online search engine could help find pertinent resources in a timely manner. For example, the participants (No. 7, No. 10, and No. 11) indicated online search engines were quick and easy to use, allowed them to get pertinent resources in a reasonable amount of time, and to find resources anytime and anywhere. Finally, *Content Quality* – 25% of the participants (N=3) believed that online search engines were a good starting place for finding reputable sites and precise articles (pointed out by participants No. 1 and No. 4).

(b) The advantages of using general educational portals

The benefits to the participants in using general educational portals were Content Quality, Perceived Usefulness and Time Issues. First, *Content Quality* – 58% of the participants (N=7) stated that the main benefit for them in using educational portals was Content Quality because “almost all educational portals provide high quality information that is reputable and reliable”. For example, the participant No. 4 said that “educational portals streamline and provide safe/reliable content”; the participant No. 5 said that “educational portals are more reputable”; and the participants No. 6, No. 7, No. 9, No. 11, and No. 12 indicated that educational portals had gathered specific subject materials that already had been sorted through, prearranged and that they trusted for high quality information. Second, *Perceived Usefulness* – 50% of the participants (N=6) thought educational portals provided specialized content for teaching (mentioned by participants No. 1, No. 2 and No. 3); “better resource to support class” (No. 10); “targeted information to typical educators” (No. 11); and “narrow content” (No. 8). Third, *Time*

Issue – one of the participants stated that the portals had narrowed down specific content that could save teachers' time for looking up materials (No. 8).

(c) The advantage of specifically using EAGLE as the portal

The benefits to the participants in specifically using EAGLE were Content Quality, Perceived Usefulness, and Social Influences. First, *Content Quality* – the main benefit for the participant visiting EAGLE was Content Quality since 75% of the participants (N=9) thought that EAGLE provided high quality of content specializing in East Asia arts and culture that they could use without having to worry about Content Quality (reported by participants No.1, No. 2, No. 3, No. 4, No. 5, No. 7, No. 9, No. 10, and No. 11). Second, *Perceived Usefulness* –50% of the participants (N=6) considered Perceived Usefulness when they used EAGLE since they indicated that EAGLE provided useful content as references to support/enhance/increase their lessons (reported by participants No. 3, No. 6, No. 8, No. 10 and No. 12). Third, *Social Norms* – 17% of the participants (N=2) stated that EAGLE's materials were able to encourage/challenge their students to learn about Asia and enhance their students' East Asia content knowledge to a high-level (reported by participant No. 2 and No. 10).

5.3.1.3 Participants' acceptance of educational portals

This study borrowed ideas from Davis (1989) to ask the participants to self-report their acceptance of using educational portals via two variables – (A) Perceived Usefulness and (B) Perceived Ease Of Use – in order to understand whether the participants' perception would influence their determination to use portals. The data source was Q13 and Q14 from the Acceptance Survey.

(1) Perceived Usefulness

Table 13 shows the results of 8 aspects of perceived usefulness when the participants used educational portals as information resources for lesson preparation. The results showed that the participants (N=10; 83%) overall had positive Perceived Usefulness to use educational portals whereas two of them (17%) had still doubts. More specifically, all participants (100%) agreed that “educational portals have supported critical aspects of their teaching”. Also, almost all of the participants thought “educational portals have enabled K-12 teachers to accomplish curriculum design more quickly (N=11; 92%), to improve their teaching quality, and teaching effectiveness (N=10; 83%), and to address their teaching-related needs (N=9; 75%)”. Nevertheless, 33% of the participants did not think that “educational portals increase their teaching productivity” and 42% of the participants did not think that “educational portals make it easier to conduct their teaching”.

Table 13. Participants’ Perceived Usefulness of Educational Portals

	N	%
has supported critical aspects of my teaching	12	100%
has enabled me to accomplish curriculum design more quickly	11	92%
has improved my teaching performance (teaching quality)	10	83%
has enhanced my effectiveness with teaching	10	83%
always addresses my teaching-related needs	9	75%
has increased my teaching productivity	8	67%
has made it easier to conduct my teaching	7	58%
Overall is useful in my teaching	10	83%

(2) Perceived Ease of Use

Table 14 shows 5 aspects of Perceived Ease of Use by the participants' when they use educational portals as information resources for lesson preparation. Although the majority of the participants perceived educational portals as easy to use, 25% of them (N=3) did not think that it was easy to follow the navigation of most educational portals and were frustrated since using educational portals required more effort to interact with and navigate through. Also, 33% of them (N=4) did not think that it was easy to learn to use educational portals and/or to recover from errors within portals. Overall, 33% of the participants disagreed with the statement that educational portal were ease to use.

Table 14. Participants' Perceived Ease of Use of Educational Portals

	N	%
Interacting with an educational portal for teachers does not require much effort (I don't become frustrated)	9	75 %
It is easy to follow the navigation of most educational portals for teachers	9	75 %
Learning to use educational portals for teachers is easy	8	67%
It's easy to recover from errors encountered while using educational portals for teachers	8	67%
Overall, most educational portals for teachers are easy to use	8	67%

When comparing the results of the participants' Perceived Usefulness and Perceived Ease of Use of educational portals, more than 80% of them believed educational portals provided useful resources and enhanced their teaching performance and effectiveness. They perceived educational portals as useful. However, 33% of them felt educational portals were not easy to use

and made them frustrated when trying to use/search through educational portals, demonstrating that more participants thought portals were not easy to use.

5.3.2 The Analysis of the Research Results

In order to answer the research questions, I used the Fisher's Exact Test, since the expected value in some cell was less than five making the Chi-squared test inappropriate, to find the relationship among the study variables, teachers' acceptance and actual usage of educational portals. Also, I used content analysis from the participants through two one-on-one interviews to extract meaningful categories for traditional statistical analysis of the research questions (see section 3.2 for details). The following shows steps taken in the content analysis.

- Summarize the participants' transcripts into categories by a deductive approach (to create a priori codes)
- Augment with an inductive approach, ground theory (to observe a phenomenon from the data set in order to merge new codes into the a priori code sets).
- Report in two different ways – to summarize observations into categories (*summative content approach*) by counted keywords and semantics – the meanings of words and sentences; and to quote the participants' transcripts as examples to explain these observations and statistics (see Appendix E & F for interview transcripts).

In addition, the Acceptance Study used EAGLE and four other portals as platforms to investigate the participants' acceptance of educational portals as information resources when they perform their lesson preparation. In particular, EAGLE is used to cross-check whether the participants' acceptance of general educational portals is different from that of a specific subject portal. Moreover, it compares EAGLE and other four portals (i.e. Asia for Educators, American

Memory, The Pennsylvania Standards Aligned System, and The History World) to figure out what features of system interface that participants are most concerned with when they search information resources on educational portals.

5.3.2.1 RQ2-1 results

To answer the first research question of the Acceptance Study, *RQ2-1*: “How do different K-12 teachers’ backgrounds differ in their acceptance of the portal”, I used the Fisher's Exact Test to analyze the relationship between the participants’ background and their acceptance of general educational portals and a specific portal, EAGLE, respectively via Perceived Usefulness and Perceived Ease of Use.

Table 15. Fisher's Exact Test P-values for the Participants’ Backgrounds and TAM Variables

Participants’ backgrounds	General educational portals		EAGLE	
	Perceived Usefulness	Perceived Ease of Use	Perceived Usefulness	Perceived Ease of Use
Gender	1	0.08 *	0.51	0.08 *
Age	0.64	0.57	1	0.008 **
Higher degree	0.454	0.32	0.03**	0.01**
Educational background	0.41	1	0.45	1
Teach Years	0.15	1	1	0.03**
Current grade(s) taught	0.15	0.55	1	1
Internet access	0.17	1	1	0.6
Computer abilities	0.14	0.57	0.7	0.12
Online search	0.47	0.58	0.57	0.27
Educational portals	1	1	0.24	0.045**

* Marginally related $p \leq 0.1$; ** significantly related $p \leq 0.05$

Perceived Usefulness was a binary variable coded as one if the participant's response to Q13-8 (Acceptance Survey) was three or four and was coded as zero otherwise. Perceived Ease of Use was a binary variable coded as one if the participant's response to Q14-5 (Acceptance Survey) was three or four and was coded as zero otherwise.

With general educational portals, the results show that the participants' backgrounds (e.g. demographics and previous ICT experiences) do not impact their acceptance via Perceived Usefulness and Perceived Ease of Use when they use general educational portals to support their lesson preparation. However, some participants' backgrounds are significantly ($p \leq 0.05$) associated with their acceptance via Perceived Usefulness and Perceived Ease of Use when they use a specific subject portal, like EAGLE, as an information resource to support lesson preparation. More specifically, the participants' highest educational degree ($p=0.03$) is significant related to their Perceived Usefulness. Also, the participants' age ($p=0.008$), highest degree ($p=0.01$), years of teaching experience ($p=0.03$), and the frequency of use of educational portals ($p=0.045$) are significant associated with Perceived Ease of Use. Additionally, it is interesting to see that the participants' gender ($p=0.08$) is marginally related to their Perceived Ease of Use either in using a general educational portal or EAGLE.

5.3.2.2 RQ2-2 results

The second research question of the Acceptance Study is to examine K-12 teachers' acceptance of general educational portals and specifically EAGLE. This is accomplished by testing the relationships among actual usage and the five study variables –Teachers' Computer Self-efficacy (TCS), Time Issues, Social Influences, System Interface, and Content Quality. "Actual usage" is a Content Analysis categorical variable (0/1/2) created during the analysis of

the first interview of the Acceptance Study. If the participants characterized their usage of educational portals, in Q7 and Q10, as ‘rarely use’, it was marked as 0; if they characterized their usage as ‘frequently’ it was marked as 2, and ‘1’ was used for a ‘it depends’ type of response.

To answer *RQ2-2*, I not only used the Fisher's Exact Test to analyze the relationships, but also used the results of content analysis from the Acceptance Interview to obtain more complete information from the participants. The following tables show these results:

A. Table 16 (the Fisher's Exact Test results) shows for general educational portals (1) the participants’ Perceived Ease of Use is significantly related to Time Issues ($p=0.02$); however, none of the five variables are significantly association with the participants’ Perceived Usefulness and Actual Usage; (2) The participants’ Perceived Usefulness ($p=0.002$) is significantly associated with their Actual Usage when they use general educational portals as information resources for lesson preparation.

Table 16. Fisher's Exact Test P-values of Five Variables, Actual Usage and Acceptance

Five variables & Actual usage	General educational portals			EAGLE		
	Perceived Usefulness	Perceived Ease of Use	Actual usage	Perceived Usefulness	Perceived Ease of Use	Actual usage
Teachers’ Computer Self-efficacy (TCS)	1	0.42	0.17	--	--	--
Time Issues	0.47	0.02**	0.42	1	0.47	1
Social Influences	1	1	0.72	1	0.46	1
System Interface	1	0.24	0.48	0.32	0.0013**	0.73
Content Quality	0.45	0.15	0.11	0.47	1	0.66
Actual usage	0.002**	0.41	--	0.002**	0.73	--

** Significantly related $p \leq 0.05$

Table 16 additionally shows for EAGLE (1) the participants’ Perceived Ease of Use is significantly related to System Interface ($p=0.001$); however, none of the five variables are significantly association with the participants’ Perceived Usefulness and Actual Usage; and (2)

The participants' Perceived Usefulness ($p= 0.002$) is significantly associated with their Actual Usage of EAGLE as information resources for lesson preparation.

Table 17. Actual Usage and Acceptance of Educational Portals from Content Analysis

	General Educational Portals	EAGLE
Actual Usage	12	12
○ Frequently use	2	2
○ Indifferently use	6	2
○ Rarely use	4	8
Perceived Usefulness	12	12
○ Can use as a resource	8	7
○ rarely use	4 <ul style="list-style-type: none"> ○ School set curriculum ○ Don't believe portal has information on their teaching subject ○ Don't know they can find useful information 	5 <ul style="list-style-type: none"> ○ School set curriculum/or only matched small portion ○ Did not update information and insufficient content ○ Only for social sciences or Art and not for physical sciences
Perceived Ease of use	7	7
○ Rarely use	7 <ul style="list-style-type: none"> ○ Too time-consuming to search ○ Hard to search through ○ Prefer to use general search engines (Google; Bing) 	7 <ul style="list-style-type: none"> ○ Too time-consuming to search ○ Hard to search through ○ Prefer to use general search engines (Google; Bing)

B. Table 17 (above from the results of content analysis) shows the participants' Actual Usage, Perceived Usefulness and Perceived Ease of Use of general educational portals and EAGLE. These variables were created during content analysis of the Acceptance Survey Interview. Concerning Actual Usage, only two participants mentioned frequently use of general educational portals for lesson preparation, four participants indicated that they rarely used educational portals and six of them indicated "may (or may not) use portals". In EAGLE, also two participants mentioned frequently actually using EAGLE for lesson preparation. But eight

participants indicated that they rarely used EAGLE and two of them indicated “may (or may not) use portals.”

Concerning Perceived Usefulness, all participants (n=12; 100%) considered that Perceived Usefulness was a factor in using general educational portals and EAGLE. More specifically, there were eight participants (67%) who believed general educational portals enabled them to use it in their teaching and/or to use as a resource; four of the participants (33%) indicated that they rarely used general educational portals. The results (in Table 17) showed that the reasons why the participants rarely used general educational portals to prepare their lessons are:

- The school already set the curriculum, as the participant No. 4 mentioned, *“the biggest reason that I am not using the educational portals often [is] because my curriculum is kind of set (curriculum initiatives)”*;
- The participants didn’t believe the subject they taught could easily be found in general educational portals, as the participant No. 7 mentioned, *“I don't think it is easy to find this much information online about physics...”*
- The participants didn’t know whether they could find what they needed from general educational portals since generally the portal provided too specific content/resources. As participant No. 1 mentioned *“the reasons ... why despite all the good content on the educational portal ... I am not sure what specific materials/resources have [been] included before starting [to]use the portal”*

In EAGLE, although seven participants (58%) believed it had provided professional East Asia content to enable them to use it in their teaching and/or to use as a reference to extend students’ knowledge of Asia culture, five of the participants (42%) indicated that they rarely

used EAGLE. There are three reasons (in Table 17) why the participants thought that EAGLE lacked Perceived Usefulness.

- It is related to their curriculum set and/or it only matched a small portion of their curriculum. As the participant No. 9 mentioned, *“One of the reasons I don’t use EAGLE very often is because I only use it to plan small unit”* and *“I think the main thing is that we only teach about East Asia for such as small portion of the year”* (No. 12).

- EAGLE did not frequently update information and did not provide sufficient content. Thus, the participants didn’t want to go back to use EAGLE again. For example, the participant No. 5 mentioned *“I am looking for something new, materials (relevant information), I think EAGLE needs more content...”*; the participant No. 9 mentioned *“I feel there’s not enough material on the EAGLE...”*; and *“EAGLE doesn’t have that much content/materials to find this time”* (No. 11).

- The participants thought EAGLE only provided content that was related to social studies, Arts, or Asian culture, but not to the science area, so they didn’t use it. As participant No. 7 mentioned, *“... EAGLE does not have enough materials that are related to my particular curriculum, science area...”*

Concerning Perceived Ease of Use, Table 17 also showed the results about Perceived Ease of Use from the Content Analysis. 58% of the participants (N=7) mentioned they rarely actually used general education portals or EAGLE. There are three reasons the participants thought that general education portals or EAGLE lacked Perceived Ease of Use.

- It was too time consuming to search a specific system on educational portals. For example, the participant No. 6 mentioned *“One of the things that would hold me back from using educational portals more frequently is the time consideration. Generally an educational portal*

has just too specific designs (its own system) that help to find the specific content or criteria”; “*in the EAGLE, there's no standardization of format*” (No. 10); “*... educational portals are more time-consuming for teachers to find specific content or criteria*” (No. 3), and “*Time limitation ... that influences teachers to use or not use EAGLE... it's a good resource but it's hard to search through ... So the biggest issues of ... use or not use ... are time and information environmental problem, not portal's content issue*” (No. 12).

- The general educational portals and EAGLE are hard to search through. As participant No. 5 mentioned “*... why [I] don't use educational portals is that it is not easy to use. ... you waste a lot of time looking for oneIf the portal doesn't have user friendly interfaces...*”; “*...EAGLE ... the interface design may need to be more easy and quick access particularly search navigation*” (No. 5); and “*EAGLE needs some improvement on its interface*” (No. 7).

- The participants preferred to use general search engines (e.g. Google or Bing) as the starting point to find specific materials and resources. As the participant No. 1 mentioned, “*... despite all the good content on the educational portal, I prefer to go online to use search engines as a starting point to find specific materials and resource.*” But if the participants found portals shown on their search results, they would search through that portal. As the participant No. 4 said

“... portal is... hard to search through. When I look for information online, I often just do a Google search or Bing search because online search engines are more ease to navigate ... I don't find the portals are popping up in my search, I don't run across them naturally (see the Appendix E –Q 7).

C. Table 18 shows the similarities and differences among the five variables from the content analysis between general educational portals and EAGLE

Table 18. Content Analysis for the Five Variables

Five variables	Similarities and Differences
Content Quality (N=10, 83% – General educational portals; (N=9, 75% –EAGLE) Social Influences (N=9; 75% - General educational portals & EAGLE)	<ul style="list-style-type: none"> • Both: Only use when preparing lessons, but stop using at all when finished preparation • Both: Curriculum sets • General educational portals: Look for useful information first, then to see whether these materials are related to or matched their curriculum sets • EAGLE: for small East Asia content units • EAGLE: Look for resources that matched curriculum sets then find relevant East Asia content • EAGLE: did not provided enough relevant
System Interface (N=6; 50% – General educational portals) (N=9; 75% – EAGLE)	<ul style="list-style-type: none"> • Both: not easy to use interface caused time issues • Both: lack navigability or screen standardization • Both: need quick search navigation • Both: need standardized system interface
Time Issues	<ul style="list-style-type: none"> • Both: Time limitation • Both: general search engines are easier to use than portals
Teachers' Computer Self-efficacy (TCS)	<ul style="list-style-type: none"> • General educational portals: only one participant pointed this out

In general educational portals, the results showed that the main issues that participants mentioned most, when they used (or not used) portals, were Content Quality which comes with Social Influences, then System Interface which goes together with Time Issues, and only one participant mentioned Teachers Computer Self-efficacy (TCS) (see Appendix E – Q 7 for details). The reasons that held the participants back from using EAGLE were Social Influence, Content Quality, and System Interface. These three variables were equally important in EAGLE, but fewer of the participants mentioned anything about Time Issues, and none of them mentioned anything about Teachers' Computer Self-efficacy (TCS). The detailed explanations are as follows (See Appendix E – Q10):

(a) Content Quality and Social Influences: the participants indicated the main reasons for them to use (or not use) general educational portals or EAGLE were Content Quality and Social Influences. These two variables always came together with each other.

(b) Table 18 shows the reasons the participants used educational portals or EAGLE were (1) the participants used general educational portals or EAGLE only when they needed to make up their lesson plan, once they finished lesson preparation, they stopped using them (portals) at all. As the participant No. 9 said, *“I try to gather all the materials at first, and I don't usually go back unless I need or forgot to get something;”* (2) Some of the participants also mentioned using EAGLE to prepare a small unit of East Asia content only. As the participant No. 12 said, *“I think the main thing is that we only teach about East Asia for such as small portion of the year;”* (3) The participants used general educational portals to find useful information first then to see whether these materials were related to or matched their curriculum sets in order to enhance their students' learning. As the participant No. 10 mentioned, *“.... the portals have provided relevant content that I'm looking for first and then the content of the portals apply to my curriculum and teaching... to stretch my curriculum ...”*; (4) the participants used EAGLE to prepare lessons because they tried to find resources that matched their teach curriculum first, and then they tried to find relevant resources on East Asia. For example, the participant No. 3 mentioned *“The reason for teachers to use (or not use) EAGLE depends on what classes they teach ... The reason why I'm spending a lot more time on this portal (EAGLE) is to get relevant information for my particular class ...”*

However, still some of the participants didn't use general educational portals or EAGLE because the school already (1) set the curriculum which defined what they taught. As the participants No. 4 said *“the biggest reason that I am not using the educational portals often is*

because my curriculum is kind of set (curriculum initiatives)”; or (2) EAGLE did not provide enough relevant East Asian content for them to search/use for new resources. As the participant No. 7 said “... EAGLE does not have enough material related to my particular curriculum...”; and “to teach Asia studies for many teachers is a small subject and then teachers have to move on to the next teaching topic. So if they don’t teach Asia studies subject, they may not use EAGLE” (No. 12).

(c) System Interface and Time Issues: the participants considered System Interface that went together with Time Issues (Table 18). The reasons for the participants didn’t used general educational portals or EAGLE were (1) not easy to use interface caused time issues – the participants indicated that if the portals didn’t provide ease of use, it was too time-consuming for them to search through the portal. For example, the participant No. 12 mentioned “... *why I don’t use educational portals is that it is not ease to use. Because some of the portals you go to and you waste a lot of time looking for...*” (2) Need quick search navigation so they preferred to use general search engines to search for teaching materials instead. For example, the participant No. 3 said “*In educational portals, when you click onto it, you usually click many times to search there. That’s why I have a tendency to use more search engines because I get that instant answer*”; “*I think EAGLE needs ... interface design may need to be more easy and quick access particularly search navigation*” (No. 5); and “*I think EAGLE is difficult to use and I certainly can’t find anything I need....*” (No. 1). (3) Need standardized system interface – most participants thought that the portals (including EAGLE) always lacked navigability or screen standardization, For example, the participant No. 10 mentioned “*why I use (or don’t use) educational portal that often, it depends on whether there is standardization of design*” as well as

“In the EAGLE, there's no standardization of format between different sections and also the lesson plan” (No. 10).

(d) Time Issues: the participants indicated that time issues (N=5; 42%) were as important a variable as system interface when they used general educational portals, but only 2 of them thought that Time Issues were important variables when using EAGLE. The reasons are (1) time limitation – the participants had time limitation to use a general educational portal or EAGLE. For example, the participant No. 12 said that *“Time limitation is another reason that influences teachers to use or not use EAGLE. We, as teachers, don't have the time to be able to devote to it ...”* and *“I think the biggest challenge to using the portal for me is that It's just too time-consuming”* (No. 10). (2) General search engines are easier to use than portals – the participants liked to use general search engines instead portals. For example, the participants mentioned below:

“Time is always at a premium for teachers and teachers try to find the fastest answer in the shortest amount of time. Thus, based on time constraints, most teachers just use Google or Yahoo or some other public search engine to type in one word and phrase. It will bring it all” (No. 3)

“... it seems like doing a Google or Bing search might yield some things more quickly or it's easier to find things. So, despite all the good content on the educational portals, I prefer to go online to use search engines as a starting point to find specific materials/resources.” (No. 1)

“I can't get "what I need" or I might not find "what I'm looking for". It discourages me from going to EAGLE. So I feel that it's easier to do in Google search since it is fast to do a Google search. ..The navigation is much easier than EAGLE and I can make one stop shopping to find information directly, not click many steps” (No. 9)

(e) Teachers Computer Self-efficacy (TCS): only one participant pointed this out for the general educational portals: *“teachers with higher confidence are willing to incorporate the portals and technology into their lessons.”* (No. 2)

In summary, the following are the findings from RQ2-2: (1) the participants' Perceived Usefulness was significantly associated with their Actual Usage when they used general educational portals and EAGLE. (2) The participants' Perceived Ease of Use was significantly related to Time Issues when searching through general educational portals. But in EAGLE, it was significantly related System Interface. (3) When the participants used general educational portals, they considered finding more relevant resources to be the important tasks. But when they used EAGLE, they considered finding something that fit their curriculum settings as most important tasks and finding relevant information as secondary. They used general educational portals for general information needs and specific portals to find curriculum required items. (4) The participants were concerned about finding relevant resources (Content Quality) as much as possible when they used general educational portals, but they considered equally finding relevant resources (Content Quality), matching curriculum settings (Social Influences), and having easy to use portals (System Interface) in using EAGLE. (5) Some participants reported they didn't actual use a specific portal, like EAGLE, because of it not often being updated with new information.

5.3.2.3 RQ2-3 results

RQ2-3 is to understand whether teachers' information-seeking behavior is significantly related to their Acceptance of and Actual Usage of educational portals. This study used EAGLE as study platform because all of the participants were recruited from the NCTA alumni who have an account on the EAGLE; therefore, all of these had experience using EAGLE. This phase of study was conducted with online survey which consisted of a 4-point Likert scale to ask the participants to self-report their information needs and information-seeking activities on EAGLE

(see section 3.2.2). The data source for Information Needs is Q16 and Information-seeking Activities is Q18 in the Acceptance Survey Questionnaire.

To answer the research question, *RQ2-3*, it first shows a summarization of the online questionnaire related to participants' information needs and information-seeking activities on EAGLE and then shows the Fisher's Exact Test to report the relationship among them. The following tables show these results:

Table 19. Participants' Information Needs in EAGLE

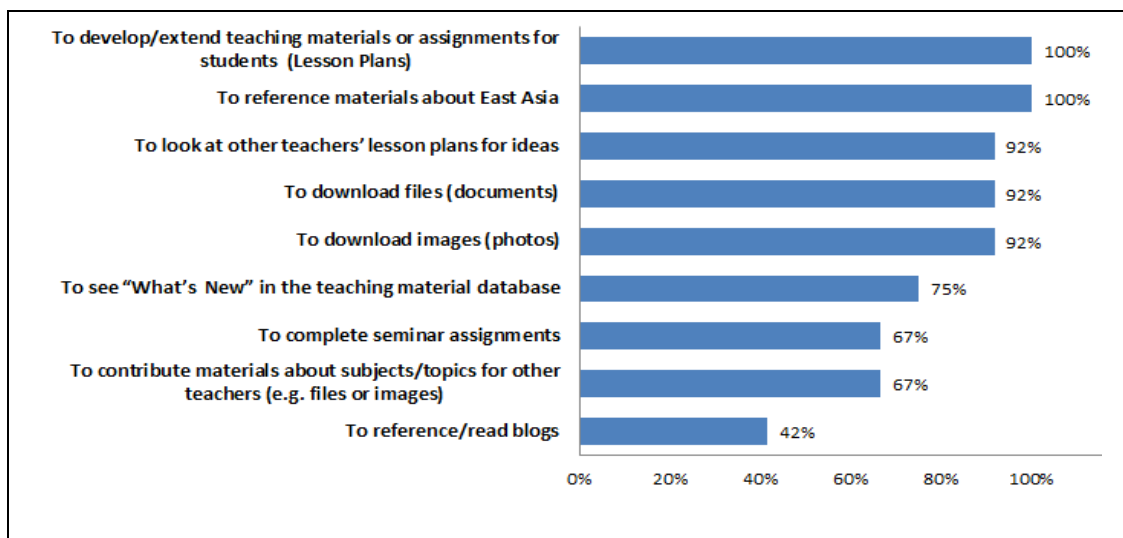


Table 19 (above) shows that the results of the participants' Information Needs (Q16) on EAGLE are (1) all participants (N=12; 100%) liked to use EAGLE to "develop/extend teaching materials and/or assignment for students (lesson plans) and "to get reference materials about East Asia"; (2) around 90% of the participants (N=11) use EAGLE "to look at other teachers' lesson plans for ideas" and to download documents and/or images; (3) 75% of the participants (N=9) would pay attention with "what's new" in the EAGLE; while 67% of them (N=8) used EAGLE to complete seminar assignments and contribute materials to the EAGLE; (4) But fewer of the

participants (n=5; 42%) get, use, and/or read references from the blogs. The result of the participants' information needs on EAGLE is similar to the participants' information needs on using general educational portals that was shown in the Factor Study (see Chapter 4.2.1.7).

Table 20. Participants' Information-seeking Activities on EAGLE

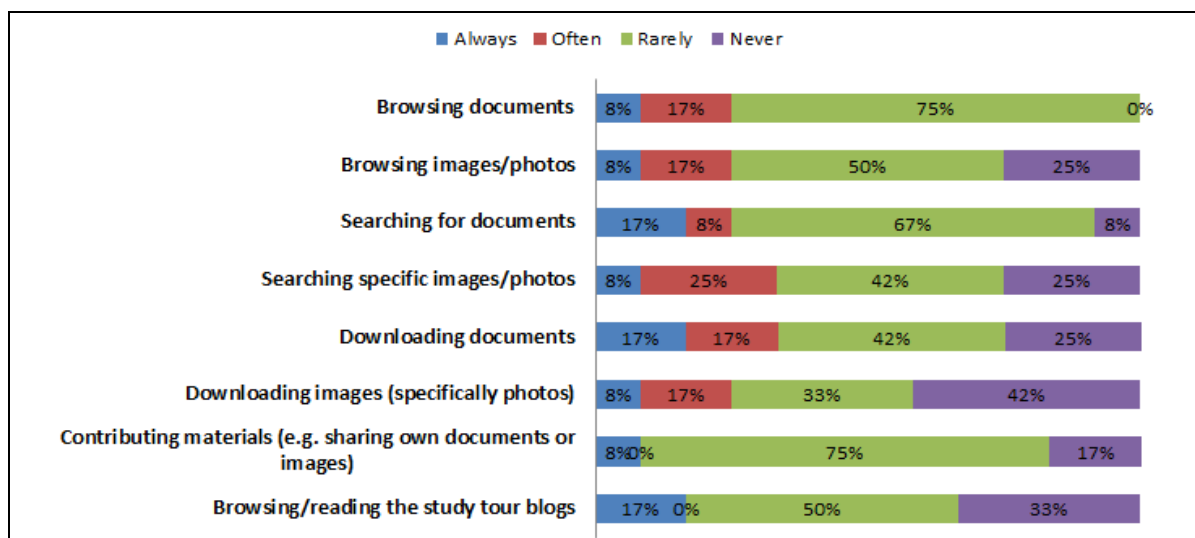


Table 20 (above) shows the participants' Information-seeking Activities (Q18) on EAGLE are: (1) participants (100%) had browsed documents on EAGLE, but some of them had no experience to "Browse the images", to "Search for" specific documents/images, to "Download documents/images", to "Contribute materials", or to "Browse/Read tour blogs"; (2) Almost participants indicated that they rarely browse, search and download documents/images from EAGLE. In other words, the results show that the participants have less information-seeking activities on EAGLE compared to the findings from the Factor Study (see Chapter 4.2.1.8) that showed most participants would like to "Browse", "Search/Retrieve", and "Derive" teaching materials when they use general educational portals. So, the participants' Information-

seeking Activities on EAGLE were performed less frequently than the participants liked to do on general educational portals.

The relationship among the participants' information-seeking behavior (i.e. Information Needs and Information-seeking Activities), Actual Usage, and Acceptance of educational portals via Perceived Usefulness and Perceived Ease of Use is (1) there is no significantly relationship between the participants' Acceptance and Information Needs or Information-seeking Activities. (2) But, it is interesting to see that the participants' Actual Usage of EAGLE is marginally related to their Information Needs ($p=0.08$), which shows that the participants consider that EAGLE provides resources that fit their information needs when they use educational portals for lesson preparation. These relationships were tested by a Fisher's Exact Test.

5.3.2.4 RQ2-4 results

To accurately answer the research question, *RQ2-4*: "What interface functions support K-12 teachers' use of educational portals as information resources for lesson preparation," the study cross-checks the participants' responses to online questionnaire questions and interview responses. In the Acceptance Survey Questionnaire, the participants have to evaluate EAGLE's system interface (Q19 to Q21), to rate the importance of four other portals' features, Asia for Educators, American Memory, The Pennsylvania Standards Aligned System, and The History World (Q23 and Q24), and then if possible, to list what should be improved in these portals' features (Q23 and Q24). The features being evaluated for each portal are listed below. They were chosen to represent features each portal implemented that EAGLE did not contain. In the Acceptance Survey Interview, the participants expressed their thoughts about user-friendliness

and the well-organized design on general educational portals and specifically on EAGLE. The system interface and functions/features are explained for three groups: (1) EAGLE, (2) Four other portals, and (3) General educational portals.

(1) Participants' opinions about EAGLE's interface

Since all participants were recruited from NCTA alumni, the study asked the participants to answer questions about their experiences of using EAGLE. Figure 19 shows the November 2014 Home Page rather than the one used during the study. The Home Page used during the study is no longer available and mainly differs from the current Home Page by the menu titles.

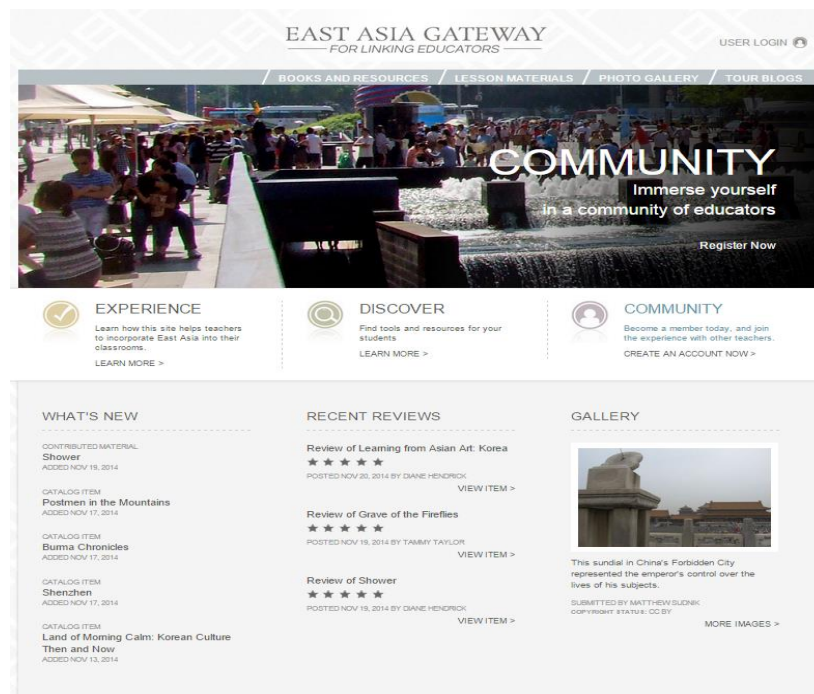


Figure 19. EAGLE's Home Page (November 2014)

EAGLE included four sections – “Teaching Materials Database” (currently called “Books and Resources”), “Contributed materials” (currently called “Lesson Materials”), “Photo Gallery”, and “Tour Blogs.” In the Acceptance Survey Questionnaire, the participants were asked about their feelings towards EAGLE’s interface design with a 4-point Likert scale and short answers (Q19 to Q21). The Acceptance Survey Interview included two questions, Q11 and Q12, to investigate more meaningfully what a useful, user-friendly, and well-organized interface should be. The results of these two sets of questions are presented below.

A. Results from the Acceptance Survey Questionnaire

This part shows the results from the online questionnaire including the usefulness, ease of use, and satisfaction with EAGLE’s system design. In Q20 of the Acceptance Survey Questionnaire, there were 11 4-point Likert scale sub-questions which included an option to provide additional information. These sub-questions focused on the participants’ experience of the usefulness of the different features available under different menu items on EAGLE’s home page which were identified above. This focused on keyword search and search filters of each menu item’s design. Likert scale responses were recoded as positive (3 or 4) or negative (1 or 2).

The additional texts were condensed to general terms describing the most frequent responses. Most participants had positive feelings of usefulness with EAGLE’s features/functions but not with Tour Blogs (Table 21). More specifically, every participant (100%) agreed that EAGLE provided useful features such as search filter (i.e. time period and type of publication) in the Teaching Materials Database, and features on the Photo Gallery (i.e. browsing, category search filter, and region/country search filter). Around 90% of them indicated that “keyword search” and “subject search filter” were useful to them when they

searched on the sections of the “Teaching Materials Database” (currently called “Books and Resources”) and “Contributed materials” (currently called “Lesson Materials”).

Table 21. The Usefulness of EAGLE’s Functions/Features

	Rankings and Suggestions
○ Teaching Materials Database (current called “Books and Resources”):	
1. Time Period search filter	100% Usefulness
2. Type of Publication search filter	100%: Usefulness
3. Keyword Search	92 %: Usefulness 8% : search had no results
4. Subject search filter	92%: Usefulness and help focus on specific search 8% : the search results are not many
5. Minimum Average Rating search filter	83%: usefulness, Good function, 17%: not necessary
6. Region search filter	83%: Good function to narrow search in specific country information 17%: not necessary
○ Contributed materials (current called “Lesson Materials”)	
7. Keyword Search	92% : Usefulness and helpful for searching 8% : don’t know why it cannot combine with “Teaching Materials” keyword search bar
○ Photo Gallery	
8. Browsing the Photo Gallery	100% Usefulness
9. Category search filter	100% Usefulness
10. Region/Country search filter	100% Usefulness
○ Tour Blogs	58% Interesting to read and helpful to get insight from others 42%: spend a lot of time to find a useful resources and/or not useful for elementary level teaching

Also, around 83% of them thought the search filter – “the minimum average rating” and “region” in the Teaching Materials were useful, but at the same time, 17% of them thought that these two features were not necessary to be provided by EAGLE. However, although around 58% of the participants thought “Tour Blogs” was interesting to read, more than 40% of the participants didn’t think Blog was a useful section for their teaching preparation.

Table 22. The Ease of Use of EAGLE's Functions/Features

	Suggestions
The category search on the Teaching Materials Database (Books & Resources)	100% : Navigability
Category Search on the Photo Gallery	100% : Navigability
Main Page design	92%: positive Navigability (Easy to navigate and scroll with information); 8% : too much scrolling down with page
Keyword Search	92% : with ease to use Navigation; 8%: it is difficult to find the keyword search (it is hidden)
Tour Blogs navigational bar	75% : positive with navigability 25% : it is difficult to navigate

Q21 of the Acceptance Survey Questionnaire has 5 sub-questions focused on the ease of use of EAGLE specifically web navigation and search navigation. The 4-point Likert scale responses were recoded as positive (3 or 4) or negative (1 or 2). The additional texts were condensed to general terms describing the most frequent responses. The participants overall agreed that EAGLE provided easy to use functions/features (Table 22). More specifically, every participant (100%) agreed that the category search on the sections of the “Teaching Materials Database” and “Photo Gallery” provided easy to use navigation. Although more than 90% of them thought that the “main page” and “keyword search” of EAGLE provided navigability, 8% of them thought too much information was provided on the “Home Page”, and search functions were difficult to understand and had important features hidden in drop down boxes. Also, 25% of the participants thought the “Tour Blogs navigational bar” was difficult to navigate at EAGLE.

Q19 of the Acceptance Survey Questionnaire (Table 23) has 10 sub-questions focused on satisfaction with EAGLE specifically with issues related to design. The 4-point Likert scale responses were recoded as positive (3 or 4) or negative (1 or 2). The additional texts were condensed to general terms describing the most characteristic response. The satisfaction of

EAGLE's interface that included information accuracy, visual appeal, web readability, web layout/organization, time issue were related to user-friendliness and good organization.

Table 23. Satisfaction of EAGLE's Functions/Features

	The Suggestions From Participants
Accuracy of information	100%: it provides quality of information
Visual appeal	92%: it provides great lay out and beautify interface design 8%: too much scrolling bar to search it
Web Readability	92% : it provides readable web 8%: some fonts are hard to read because of contrast with background
Web organization	92%: it provides a well organization screen that support clear search web organization 8%: too many tags to click
The layout of the "Photo Gallery"	92%: it provides an easy to scroll on the photos/images section (don't take too much time to search). Also the images provided here are beautiful 8%: don't always use
Time it takes to find images/photos	92%: it won't take too much time to find images/photos 8%: depends on the photos
The layout of the "Teaching Materials Database" (Books & Resources)	83%: it provides simple grouping and highlighting of information 17%: prefer the portal can provide categories such as grade levels) that doesn't exist
Time it takes to find teaching materials on the Teaching Materials Database	83%: the time to get the feedback of search results are acceptable 17% depends on the topics searching
Navigation	75%: design is pretty traditional way that provides simple and easy to use navigation 25%: need more specific search support (e.g. grade level)
Relevance of Information	67%: it provides the useful information for teaching 33% Difficult (have a hard time) to find the relevant information because it is not ease of use

The participants had a positive satisfaction with the functions/features that were provided on EAGLE. More specifically, all participants (100%) indicated that EAGLE provided quality information –“accuracy of information”. In detail, more than 90% of them had a positive reaction to EAGLE's interface design on “visual appeal”, “web readability”, “web organization” and

“Photo Gallery layout”; while around 80% of them were satisfied with the layout of “the Teaching Materials Database (Books and Resources) and “the time it takes to find the teaching materials on the teaching materials database”.

Table 23 also shows 75% of them thought EAGLE had provided satisfactory navigation; while more than 60% of them were satisfied with the relevant information that was provided on the portal. However, there were still some people not satisfied with the features that were provided on EAGLE and gave their suggestions. In particular, 25% of them thought EAGLE was hard to navigate, and one-third of them (33%) had a hard time and it was not easy to find relevant information on EAGLE. In the Acceptance Survey Questionnaire, the participants overall indicated that EAGLE provided many useful resources, but sometimes it was difficult to find relevant ones for some topics. Also, it required too much scrolling for searching, had hard to read fonts, had too many tags to click, and should provide more search categories (e.g. grade levels).

B. Results from the Acceptance Survey Interview

This shows the content analysis results that explain what the participants thought about the usefulness, user-friendliness, and organization of EAGLE when they used it as an information resource for lesson preparation. Q11 of Acceptance Survey Interview is the data source for this section. Concerning the usefulness of EAGLE, the results show that most participants (N=10; 83%) thought that EAGLE was a useful portal. But still two of them (17%) thought EAGLE was not a useful portal because their teaching subject did not match what EAGLE provided. Participant No. 7 said *“for my specific content area there is not enough material there”*; and participant No. 5 said *“EAGLE needs to update more with new content... and the search function did not assist participants in fulfilling their information needs”*.

Q12 of Acceptance Survey Interview is the data source for this section. The a priori codes are listed as System Interface and Content Quality in Table 24. The “added from initial coding of interview” reflects “personalization” which was added. Concerning user-friendliness and organization on EAGLE, Table 24 (below) shows that the participants thought EAGLE did a better job at providing better organization than it did at providing a user-friendly interface, as the participant No. 9 said, *“I will say EAGLE is well-organized, but maybe not user-friendly....”*; and *“It’s better well-organized compared to before...”* (No. 5)

Table 24. The Results for EAGLE to be a User-Friendly and Well-Organized Portal

		Total Number & Percentage (N=12)		Well-organized & user-friendly (N=3; 25%)		Well-organized, but Not user-friendly (N=6; 50%)		Not well-organized and Not user-friendly (N=3; 25%)	
		N	%	N	%	N	%	N	%
system interface	navigability	12	100%	2	17%	7	58%	3	25%
	grouping / highlighting of information	9	75%	1	8%	5	42%	3	25%
	communication channel	4	33%	1	8%	1	8%	2	17%
	quantity of information presented	3	25%	1	8%	1	8%	1	8%
	usage of multimedia elements	3	25%	0	0%	1	8%	2	17%
	explanation	3	25%	0	0%	3	25%	0	0%
	screen display standardization	1	8%	0	0%	0	0%	1	8%
	feedback (notification)	1	8%	0	0%	1	8%	0	0%
content quality	relevant content/ resource	6	50%	1	8%	2	17%	3	25%
	content generation	0	0	0	0%	0	0%	0	0%
	quality of content organization	0	0	0	0%	0	0%	0	0%
Added from initial coding of interview	personalization	2	16.70%	0	0%	2	16.70%	0	0%

Table 24 also shows that all of participants (100%) are concerned with “Navigability” at EAGLE since 12 of them (100%) mentioned Navigation during the interview. But, only 17% of them (N=2) thought EAGLE provided a well-organized and user-friendly navigation. In particular, most participants indicated that EAGLE was well-organized (N=7; 58%), but it did not have user-friendly search functions (Table 24).

“... EAGLE ...[is] well organized because there are a lot of different things that you could search for such as you could look for specific region, you could just look at a specific type of material (e.g. photographic)..... But it is not very user-friendly because the search menu is a little hard to use. Also there are two different places that you have to search (the Teacher Materials and the Contributed Materials). It would be nice to save time if you could have a search to do for all” (No. 9).

“From the main page here, we can actually see the different category lay out there ... So you get a sense of organization and that there's a lot available hereAbout user-friendliness it needs to be improved ...: (1) on the main page (right up there or somewhere) should have a search bar. I think it would help teachers with conducting navigating through different databases. So, there it is lacking a search bar and some categories search menu in the front.... (2) The portal has different keywords search for different selection (“Teaching Materials Database” and “Contributed Materials”) with different options to choose from. It might be better just one (5) For the Photo Galley, if there is a drop-down menu first search, and so you can refine and narrow down ... rather than having to take the time to look through all of it to find, and there's a lot of page turning a lot of pictures in the photo gallery...” (No. 6)

Table 24 (above) shows that the participants were concerned with “Grouping/highlighting of information” at EAGLE since 75% of them (N=9) mentioned Grouping/highlighting of information during the interview. But only one of them thought EAGLE was a well-organized portal with a user-friendly design. Specially, the participants thought that EAGLE was well-organized (N=5; 42%), but did not have a user-friendly design (n=3; 25%) particularly in the “Contributed Materials” section. As the participant No. 5 mentioned, *“...the Contributed Materials can be better ... reorganized/grouped into topics, authors’ name/ profiles, grade level materials or even give more descriptions that teachers can evaluate and give credibility of*

materials... ”; and the participant No. 6 said that “... the Contributed Materials if they are broke down with little drop bars, categories and with further description from an individual post. It would be worth and feasible to look through the pages...So it’s probably easier to access and save time”.

In Table 24 (above), some of the participants were also concerned with “Communication channel” (N=4; 33%) on EAGLE as well as “Quantity of information presented,” “Usage of multimedia elements” and “Explanations” (N=3; 25%). As participant No. 6 mentioned, “...*The Discover in the main page with a little magnifying glass is confusing that I thought it would lead us to a search. But when I click on it, not, it is releasing and brings up something else...*” In addition, the participants thought the feature of “average rating” was a good “Communicational Channel” to help them to figure out relevant/useful content from what others used. As the participant No. 4 said, “*I like the rating feature a lot, and I thought if it grows that would be really nice to see what other educators have thought about other contributed materials*”; and the participant No. 1 mentioned that

“I think the rating system to level rating stars with different sources that was very good in Teaching Materials Database. ... it is similar to Amazon ..., there's rating system there to see how many people think about an item. ..., I think it is useful ... to know if this resource is available to be incorporated into class from others”.

Table 24 finally shows that Content Quality – relevant content was an important aspect of what influenced the participants’ conceptions of a user-friendly and well-organized design. The results displayed that one important impression that the participants had about EAGLE’s user-friendliness and organization was whether they found useful and accurate resources from EAGLE (50% of the participants (N=6) mentioned this). For example, the participant No. 11 said

that “*I think it [EAGLE] is still young, so sometimes it is hard to find relevant sources*”; and the participant No. 1 mentioned

“... I think EAGLE is lacking in content. As I tried to search for things and I still didn’t find some content I needed at EAGLE. So the problem is I never could figure out what was all available on the portal ... I think probably EAGLE is lacking content or a good search function”.

In summary, according to the Acceptance Survey Questionnaire the participants were overall satisfied with EAGLE’s functions/features and thought that it provided useful resources with an easy to use system interface. However, according to the Acceptance Survey Interview, the participants were more satisfied with EAGLE’s organization than its user-friendliness. Finding relevant content easily influenced the participants’ judgment of user-friendliness and the quality of EAGLE’s organization. Also during the interview the participants gave more subjective judgments about what EAGLE lacked in its System Interface and what functions/features they were concerned with. The following are the four suggestions from the participants about EAGLE’s system interface. First, although EAGLE provided useful East Asia resources, its search navigation (navigability) should be improved (either the keyword search or search filters/categories in the Teaching Materials Database and the Contributed Materials) because the participants sometimes had a hard time finding relevant materials. For example, EAGLE provided “hidden” and separate search functions on each section that were frustrating to the participants the first time they used EAGLE. Also, the participants said they didn’t know what materials belonged where (in the Teaching Materials Database or in the Contributed Materials), all they wanted was to search and to find whatever they needed immediately. Second, Grouping and highlighting of information on EAGLE should be improved particularly in the section of the Contributed Materials. Third, having Communication channels and/or improved rating features which could encourage the participants to use EAGLE. Fourth, the features on

Tour Blogs should be improved since the participants think it is helpful to see what others thought, but it was not easy to navigate.

(2) Participants' opinions about the four other portals' interface

In order to thoroughly understand what other interface features would be important to assist teachers' acceptance of educational portals, the Acceptance Survey Questionnaire also asked participants to evaluate sixteen features from four educational portals that weren't provided by EAGLE. The four portals were recommended by the Factor Study participants as useful portals. These four educational portals are: Asia for Educators (<http://afe.easia.columbia.edu/>), American Memory (<http://memory.loc.gov/ammem/index.html>), The Pennsylvania Standards Aligned System (<http://www.pdesas.org/module/content/search/>), and History World (<http://www.historyworld.net/>). In Q23 of the Acceptance Survey Questionnaire, there were 16 4-point Likert scale sub-questions which included an option to provide additional information. These sub-questions focused on each of the four other portals' features that were lacking on EAGLE. There was an additional question which gave the participants the option to identify some items they were interested in on each portal, but no participants even had any additional comments to make. The 4-point Likert scale responses were recoded as positive (3 or 4) or negative (1 or 2).

A. Asia for Educators

Asia for Educator (<http://afe.easia.columbia.edu/>) is provided by Columbia University (Figure 20). The purpose of evaluating this page is to compare EAGLE to other pages that also provide Asia content for faculty and students to learn world history, culture, geography, art, and literature. The Acceptance Survey Questionnaire of this study pulled out seven features from Asia for Educators to ask the participants to evaluate including (a) Search Bar (on main page),

(b) Image Categories/subjects, (c) Sources by Time Period, (d) Timelines and Resources, (e) Teaching Modules, (f) Literature Across the Curriculum by grades (under the category of “Language Art”), and (g) Links to Related Resources (at the bottom of the main page or booksellers) . The results of each feature are as follows:

(a) Search Bar (On Main Page): all participants (100%) agreed that the search bar on the right top of main page was an intuitive design that helped them to directly access and quickly search for whatever they needed /wanted on the portal.

(b) Image Categories/Subjects: all participants (100%) agreed that image categories saved time and made it easier to find resources that were visually organized.

(c) Sources by Time period: all participants (100%) agreed that directly searching by time period provided for easy and focused searching. It was useful and helpful to narrow down history immediately for participants.

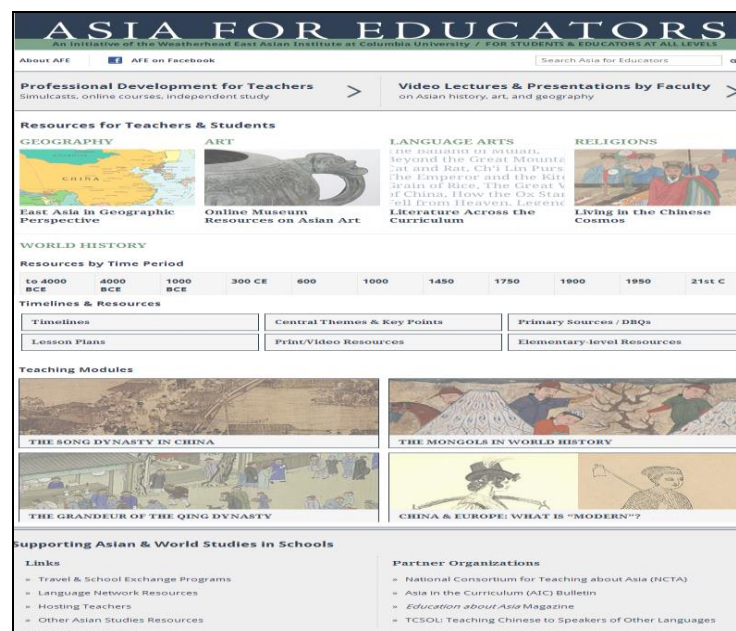


Figure 20. The Homepage of Asia for Educator

(d) Timelines and Resources: all participants (100%) agreed that combining the timelines and resources was a useful function that helped them to match with existing curriculum and grade level they were teaching. It was useful and saved time for lesson preparation.

(e) Teaching Models: most of the participants (92%) thought the feature of Teaching Models provided wonderful and comprehensive resources. However, one of them thought it was too narrow and specific of a resource that was not really useful to their lesson preparation.

(f) Literature Across the Curriculum by grades (under the category of “Language Art”): most of the participants (92%) thought this feature was a time saver and was useful/helpful in performing their lesson preparation. However, one of them thought it was not useful for their course since that participant thought different school’s students have different level needs.

(g) Links to Related Resources (at the bottom of the main page): only two-thirds (67%) of participants agreed that the link to related resources was helpful to them to find more relevant information. However, 33% of them didn’t think it was useful since it was too time-consuming to look through other links.

B. American Memory

American Memory (<http://memory.loc.gov/ammem/index.html>) is provided by the Library of Congress (Figure 21). The purpose of evaluating this page is that it provides image resources, audio, video, and archived content from the public domain. The online questionnaire for this study pulled out five features from American Memory to ask the participants to evaluate including (a) Navigation bar (on top of main page), (b) Browse collection by topics, (c) Collection highlight, (d) Today in History, and (e) Alphabetical Search under “Browse Collection by topics”.

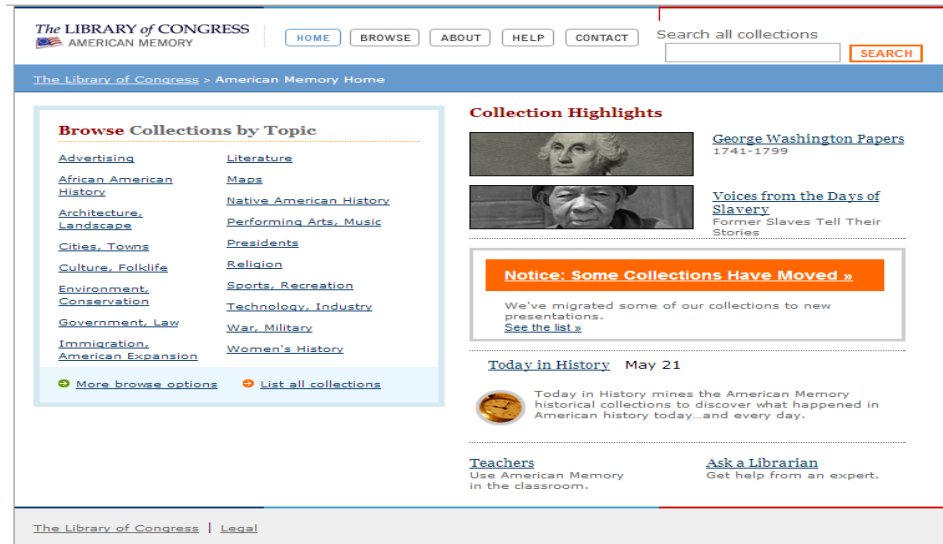


Figure 21. The Homepage of the American Memory

The results for each feature are as follows:

(a) Navigation Bar (On Top of Main Page): only 67% of participants agreed that the navigation bar (on top of main page) was a well-organized position/function to organize the resources on the home page that helped make access easier and assist in movement through the portal. However, 33% of the participants thought its organization was too broad for searching since it was too time-consuming to look through all the links.

(b) Browse Collection By Topics: 75% of the participants agreed that to browse the collection by topic speed up searching. It helped to know what collection/topics were offered by the site, and it helped users to stay focused and to narrow down material from the portal. However, 25% of them thought this site provided too broad a range for searching with just too many topics.

(c) Collection highlight: Half the participants (50%) thought Collection highlight was an interesting feature. However, it provided too specific information that made this feature useless,

limited and a distraction. The participants thought the feature provided too specific topics/information; it was not helpful or useful for teaching preparation.

(d) Today in History: 67% of participants agreed that Today in History was an interesting feature that provided good information for participants to learn historical items. However, 33% of the participants thought it was not a necessary feature; in particular, it was not relevant for the course preparation since it contained too narrow topics.

(e) Alphabetical Search under “Browse Collection by Topic”: 75% of the participants agreed that Alphabetical Search helped participants to easily find and search for items and it was a useful feature to help them walk through all the collection. However, 25% of them thought it was a useless feature since participants needed to know the relevant resources before retrieving them. Some of them stated that they would like to use keyword search instead.

C. The Pennsylvania Standards Aligned System

The Pennsylvania Standards Aligned System (<http://www.pdesas.org/>) provided by Pennsylvania Department of Education as a collaborative product for K-12 teachers (Figure 22). The online questionnaire of this study pulled out three features from the Pennsylvania Standards Aligned System to ask participants to evaluate, including (a) web navigation, (b) search by grade level (under “Curriculum Framework”), and (c) teaching frameworks (under “Instruction”)



Figure 22. The Homepage of the Pennsylvania Standards Aligned System

The results for each feature are as follows:

- a) Web Navigation (on top of main page): 83% of the participants agreed that Navigation Bar (on top of main page) was useful to assist the search process since it provided clear explanations and a sub-search bar. It was a good option for starting searches and provided a direct and quick feature to find specific information. So it was a simple and concise feature. However still 17% of them thought it didn't bring up pertinent information directly.
- b) Search by Grade Level (under "Curriculum Framework"): 75% of the participants thought it was a helpful feature to narrow search and link to grade levels. However, still 25% of them thought this feature failed to bring up exactly what participants were looking for.
- c) Teaching Frameworks (under "Instruction"): around 58% of the participants thought it was helpful for writing curriculum. However, around 42% of them indicated that they never used the teaching framework on the portal because they were in private schools and they thought that for the public school curriculum development this may be more useful. Also, some participants

thought it had too many explanations and examples; it was too time-consuming if one went over all of them. So it would be better if the system gave some (fewer) useful examples as suggestions.

D. History World

History World (<http://www.historyworld.net/>) provides Ancient history of humanity and archaeology (Figure 23). The “Tag Cloud” is only one feature that the online questionnaire of this study has pulled out to ask the participants to evaluate. The result showed that only 50% of the participants thought it was an interesting way to present information in a visually engaging feature. However, it was not an essential feature for lesson preparation since the participants thought it was too flashy.



Figure 23. The Homepage of History World

In summary, the participants thought (1) “Asia for Educator” provided all the important features that helped them directly and quickly access the portal and find the resources they wanted. (2) The participants believed that an obvious search bar on the right top of the main page

(for current interface design) was an intuitive design which could be used to directly access and to quickly search for whatever they needed from the portal; it is an important part of a good search bar (adaptive search). (3) The Image categories provided visually organized data that saved the participants' time and let them find resources easily. (4) Sources that were shown by time period (timelines) were important to show historical relationships immediately also helped the participants to search for specific time period resources. (5) Having a clear explanation and grouping/highlighting of resources were important features when the participants were seeking information on portals. (6) Teaching models showed the participants how to use resources comprehensively as well as appropriate grades level. However, most participants didn't think American Memory provided easy access and good features on its portal although it included much information from public domain. Also, the participants didn't like too specific/narrow topics/features and/or too distracting resources that did not help their lesson preparation.

(3) Participants' opinions about general educational portals' interface

This study also asked the participants to self-report what they thought about a well-organized and a user-friendly interface when using general educational portals. Table 25 shows that the "Grouping/ highlighting information," "Navigability," and "Relevant content/resource" are three important features that should be included in order to support the participants using educational portals as information resources for their lesson preparation. The data sources for this question were Q8 (for user-friendliness) and Q9 (for well-organized) of Acceptance Survey Interview. All codes used in content analysis were a priori codes.

Table 25. General Educational Portals’ Well-Organized and User-Friendly Interface

		Well-Organized (N =12)	%	User-Friendly (N =12)	%
System Interface	Grouping/ highlighting of information	12	100%	9	75%
	Navigability	11	92 %	9	75 %
	Screen standardization	7	58%	1	8%
	Multimedia elements Usage	6	50 %	2	17%
	Quantity of information presented	6	50 %	0	0 %
	Explanation	2	17%	0	0%
	Communication channel	0	0 %	3	25%
	Feedback (notification)	0	0 %	2	17%
Content Quality	Relevant content/resource	7	58%	8	67 %
	Content generation	1	8%	0	0%
	Content organization quality	0	0%	0	0%

Table 25 first shows that all of the participants were concerned with a well-organized interface design that should have “Grouping/Highlighting of Information” since it helped the participants to easily read information, by avoiding clutter, and confusing design (i.e. to group different subject into different small groups, to highlight relationships between different groups of resources). As participant No. 1 mentioned as follows and drew a picture as Figure 24below:

“I am not sure what is good,... but if there's something that you can highlight information and the portal opens up a series of other options and opens the series... As the figure [below], I can view whole information on the home page and click into actual topics and it has a lot of layer/linear/outline on the screen”

Also, with respect to the user-friendly interface design, 75% of the participants (N=9) pointed out “Grouping/Highlighting Information” as a factor. As the participant No. 1 mentioned, *“I think Asia for Educators, ... having different group of topics that users can*

distinguish from different groups of data by the topics and subject can save time and avoid getting lost.”

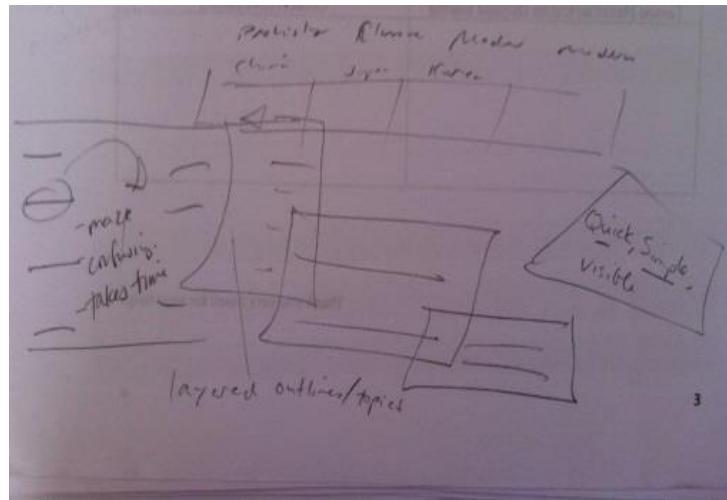


Figure 24. A Well-Organized Portal Was Drawn by the Participant No1

Also, with respect to the user-friendly interface design, 75% of the participants (N=9) pointed out “Grouping/Highlighting Information” as a factor. As the participant No. 1 mentioned, *“I think Asia for Educators, ... having different group of topics that users can distinguish from different groups of data by the topics and subject can save time and avoid getting lost.”*

Table 25, above, also shows that more than 90% of the participants (N=11) were concerned that the well-organized interface design should provide intuitive and easy to use “Navigation” (e.g. menu navigation and search facilitation) as well as being part of a user-friendly interface (N=9; 75%) . In particular, most of the participants mentioned “Navigability” in well-organized designs that indicated menu navigation for the whole page. But, when they said “Navigability” with respect to a user-friendly interface, they meant search facilitation. The

examples from the participant No. 6 who indicated that a well-organized design should be “*I think a well-organized design would be clearly laid out and visual and without much difficulty so that you can navigate it ...Asia For Educators, it has different categories, online sources, and lay out (e.g. geography, arts, language arts and religions) ...*” and a user-friendly interface design of educational portals should be:

“User-friendly aspects of an educational portal in my opinion would be a search menu or search bar with an advanced search functions that you can specify and narrow down the search parameters. So search parameters can really guide you to exactly what you're looking for and hopefully to save your time.... Again, the user-friendly educational portal design to me is saving the little bit of time; and likewise turning up good quality results from the search menu that would be able to be incorporated into a lesson” (No. 6)

Thirdly, Table 25 shows that the participants consider “Relevant Content/Resources” should be an important aspect for a well-organized design (n=7; 58%) as well as a user-friendly interface (n=8; 67%). So they can easily find resources and use them. For example, the participant No. 7 said “*The well-organized portal design ... is where I can figure it out on my own without getting confused or lost ... Also I can easily follow to see what teaching resources... and save those Materials/resources even in Microsoft Word*”; and the participant No. 1 said “*I think “Asia for Educators,” which is more user-friendly, since users can distinguish from different groups of data by the topics....*”

Table 25 above finally shows that the participants were concerned with “Screen Standardization” (n=7; 58%), “Multimedia Elements Usage” (n=6; 50%), and “Quantity of Information Presented” (n=6; 50%) when they focused on well-organized design but not equally when considering the user-friendly interface. In well-organized designs, the participants were concerned with (1) “Screen Standardization” – to exhibit information in a consistent and effective format across the portal’s pages to reduce users’ access time on searching for desired information; (2) “Multimedia Elements Usage” – to show information with multimedia elements

(e.g. pictures, diagrams, video, and sound) in order to help participants processing textual information; and (3) “Quantity Of Information Presented” – to display information with these organized techniques (e.g. visual design, information customization and personalization). For example, the participant No. 1 said “ ... *the design should be better with screen standardization display than the current site*”; the participant No. 2 said “... *I would like YouTube functions to find any topics. It is screen display standardization, Grouping information, use video & audio to present content.... I would be able to find them so easily on any topics...*”; and the participant No. 8 mentioned

“... I have used ... teachinghistory.org.... it displays with an organization such as the quick links for the grade levels... I'm a very visual person. The appearance of colors/visuals distinguishes this content and makes the difference, so I can easily get this ... with units such as there is in introduction video, teaching materials and history content or best practices and so on....”

With respect to user-friendly interfaces, more participants considered “Communication Channel” (N=3; 25%) more important than “Screen Standardization” (N=1) and “Multimedia Elements Usage,” (N=2). Table 25 shows that the participants thought that Communication Channel could facilitate obtaining up-to-date information from a portal. For example, the participant No. 5 said “*the user-friendly portal should include two things: the connection between the portal and social media, and also bundle many sources (e.g. arts, music, speech or pictures).*” The participant No. 6 stated “*the ‘recommended by other teachers’ ... that is also useful too, such as seeing the feedback, communicating and/or reviewing from others.*”

In summary, the overall findings from RQ2-4 show that a well-organized (intuitive and easy to navigate through the whole page) and user-friendly portal (a simple and adaptive search function) are important for participants searching for resources through educational portals. Otherwise, the participants may misjudge how to find relevant resources on these portals and not

believe the portal contains information relevant to their requirements. In other words, having portals be organized and user-friendly influences the participants' thinking about the existence of relevant information on the educational portals. For example, the findings from the interview of general educational portals and EAGLE showed the top three features that the participants considered as important system features when designing user-friendly interfaces and well-organized design included *Navigability*, and *Grouping/Highlighting of information*, and *Relevant content/resource*. That is, the participants thought these features helped portals to provide direct and quick access and to assist them to find the resources they wanted. On the contrary, an inappropriate web organization and search navigation made the participants confused and led them to despair of finding relevant resources. As the participant No. 1 said, "... *I tried to search for things and I still didn't find some content I needed at EAGLE. So ... I just wouldn't use it. Or...I think probably EAGLE lacks content or needs a good search function*" (see Appendix E Q11). Thus, "Navigability" and "Grouping/Highlighting of Information" are important features that influence participants' use, or not, of portals as well as "*Relevant content/resource*".

In addition, the visual category, standardization, multimedia elements, communication channel and clear explanation assisted the participants to save time when accessing the portal to obtain desired resources. The participants indicated that a visual category with a quantity of information, standardization, and multimedia elements presented also made web and search navigation more focused (e.g. Timeline and Resources on Asia for Educator) which helped the participants to easily recognize content and to incorporate resources into their lesson preparation as well as the features of communication and feedback channel to facilitate the participants to acquire up-to-date information from the portals.

5.3.2.5 RQ2-5 results

According to literature review (see section 2.1.2) and the Factor Study results, teachers' confidence and belief in their ability to perform computer tasks influence them to use educational portals as information resources when preparing lessons. However, the importance of Computer Self-confidence was unclear in the Acceptance Study-1 Interview. Acceptance Study-2 was therefore carried out to ask participants to self-report their Teachers' Computer Self-Efficacy (TCS) in the Self-efficacy Interview to confirm whether TCS is an important issue that influences teachers' acceptance of educational portals as information resources or not. This study used ideas from Compeau and Higgins (1995) to measure computer self-efficacy in three dimensions. The three dimensions of the Teachers' Computer Self-Efficacy were: Teachers' Computer Self-efficacy Strength (TCSS), Teachers' Computer Self-efficacy Generalizability (TCSG) and Teachers' Computer Self-efficacy Magnitude (TCSM).

To answer *RQ2-5*: "Whether Teachers' Computer Self-efficacy (TCS) should be considered as an important variable that influences K-12 teachers' acceptance and actual usage of portals," I used Fisher's Exact Test and content analysis to analyze the relationship among the Teachers' Computer Self-efficacy dimensions, Actual Usage, and Acceptance of general educational portals via Perceived Usefulness and Perceived Ease of Use. Also, I used the a priori codes for the content analysis of Teachers' Computer Self-efficacy that came from Bandura (1994) which is discussed below. The data source was all the questions in the Self-efficacy Interview (Q1-Q11). There were no additional codes created during coding of the self-efficacy interview for TCS. The variables, Perceived Usefulness, Perceived Ease of Use, and Actual Usage, were also created during the content analysis of the Self-efficacy Interview.

Table 26. Fisher's Exact Test of TCS in General Educational Portals

	TCS dimensions	Perceived Usefulness	Perceived Ease of use	Actual usage
TCS Strength	enjoy	1	0.4286	0.1429
	comfort level	--	--	--
	confidence	--	--	--
	enjoy	1	--	1
	comfort level	0.4286	1	0.4286
	confidence	1	1	1
	Incorporate and Reshape	--	--	--
TCS Generalizability	address various computer issues when using educational portals	1	1	1
	dealing with different functions/features	0.0476 **	1	0.0476 **
	using a new educational portal	1	1	1
TCS Magnitude	address unexpected computer issues	0.4286	1	0.2571
	dealing with difficult functions/features	0.4286	1	0.2571
	you keep trying to use portals until you find the resources	1	1	1

** Significantly $p \leq 0.05$

Table 26 shows the results of Fisher's Exact Test. The participant's confidence in using different domain of computer technologies (Teachers' Computer Self-Efficacy Generalizability) ($p=0.047$) is significantly related to the participant's Perceived Usefulness and Actual Usage of educational portals as information resources for lesson preparation. But, none of dimensions of Teachers' Computer Self-efficacy is significantly association with the participants' Perceived Ease of Use of general educational portals.

In the content analysis, I measured the three dimensions of the Teachers' Computer Self-Efficacy (TCS) (see Appendix D) and each of these dimensions was analyzed based upon Bandura's self-efficacy (1994) (see Appendix F). Bandura's original aspects (1994) included four main sources because these sources affect a person's belief in his/her ability to perform

specific tasks: (1) mastery experience (a person's previous success and/or failure experiences), (2) vicarious experience (a person's observation of others' successes and/or failures), (3) verbal persuasion/social persuasion (a person has been persuaded by peers, colleagues, or others), and (4) affective arousal/emotional state (a person's emotional state such as anxiety, stress, arousal, and mood states).

(1) The Strength of Teachers' Computer Self-efficacy

Teachers' Computer Self-efficacy Strength (TCSS) seeks to understand whether teachers feel confident when performing various computers tasks or, conversely, feel anxious, stressed, etc. when performing these tasks. This study evaluates teachers' feelings of enjoyment, comfort level and self-confidence in using computer hardware/software and educational portals, and their self-confidence in incorporating and reshaping resources from educational portals into their own curriculum.

Table 27 first shows that each question result was divided into two groups (positive feelings and negative feelings) and then displays the results of the Teachers' Computer Self-efficacy Strength (TCSS) that are divided into 3 parts from the questions of feelings of using computer software/hardware, using educational portals, and integrating resources from educational portals into lessons. Overall the participants (N=6) had positive feelings about performing computer tasks with respect to hardware/software, but not for educational portals (N=2). Also, all the participants had positive confidence on incorporating/reshaping resources from educational portals into lesson preparation. Transcripts of Question 1 to Question 7 are in the Appendix F.

Table 27. The Results of Teachers' Computer Self-Efficacy Strength (TCSS)

	Using computer hardware/software	Using educational portals	Incorporating/reshaping
Positive feelings of Enjoyment, Comfort level, and Self-confidence	N= 6	N= 2	N= 7
Negative feelings of Enjoyment, Comfort level, and/or Self-confidence	N= 1	N= 5	N= 0

Table 27's Using Computer Hardware/Software column shows that almost all participants had positive feelings of enjoyment, comfort level, self-confidence in using computer hardware/software because they had positive mastery experiences and affective arousal in preparing lessons with computer technologies. As the participant No. 3 said, *"I very much enjoyed... and I am very positive and comfortable in using the computer. Also I have self-confidence in using the computer to perform tasks"*; and the participant No. 5 said *"about using computer to prepare lessons, I enjoy it, feel comfortable and have high self- confidence since I am a very active computer user"*.

Also, the reason that participants felt confident of using computer hardware/software was because they had successful prior mastery experiences thought of computer technology as one with a Perceived Usefulness and a Perceived Ease of Use. For example, the participants thought computer technologies provided efficient and productive ways to save time and help them to look up new ideas/resources, make documents digitally, expand teaching materials, and enhance teachings.

"The reason that I am so confident in using computer to prepare lessons is because as soon as computer is available, I used it... Also, computer is able to save documents digitally... It is efficient and productive. It just saves the most of my time. I can share information. I can connect with other educators. ... a lot of efficiency. ... Also, my school gives time for us to play. " (No. 5)

“... I enjoy using the computer to look up new ideas and prepare examples for my students to be able to learn in my classes. I feel very self-confident in using the computer to show the tasks; and I have found this new venue (using computer) for lesson plans definitely enhances my teaching because there were many ways/ideas I can teach in mind. An example is when I teach drawing the face, I have a certain way to draw the face, and I found the great YouTube video of someone is getting the beautiful results that I do... this in a little bit different way. So that gives the kids options to view how others can be successful ...draw a face” (No. 3)

However, there was one participant who stated that she didn't enjoy using computers because of negative affective arousal.

“I am not enjoying it because it is work. Computer is good thing for me and I appreciate and value it as an important tool which helps me to organize teaching materials and save time. But it is not fun and I don't looking forward to going on my computer” (No. 9).

Table 27's Using Educational Portals column shows that only two participants had positive feelings (enjoyment, comfort level, and self-confidence) from seeking information on educational portals, but five of them had negative feelings. As the participant No. 1 said *“I don't enjoy and feel comfortable using educational portals.... I have more negative than positive self-confidence seeking information on educational portals. The reason I don't enjoy it because in my experience in the past using these portals...”* Another reason that the participants didn't experiences enjoyment, feel comfortable, and/or didn't have self-confidence in using educational portals was because the first impressions are the most lasting. The participants, who had previous failure experiences when using educational portals for the first time, created negative affective states continually when they sought information resources in the portals. As the participant No. 1 said, *“The reason I don't enjoy because in my experience in the past using these portals...So, I think even if these portals would be improved, my first experience would not be, and it was not positive”.*

Also, educational portals are lacking a perceived ease of use, too time-consuming, and lacking a perceived usefulness. The participants did not feel confident in using educational portals because they had failed previous experiences, because educational portals did not provide an easy to use search system (“has its own system”, “non-standard web design”, “too time-consuming”, “education portal always is too compartmentalized which takes time to navigate the portal and find resources”, “could not find relevant resources on later visits” and “the resources in ICT often change their location which makes it hard to find relevant resources again”).

Transcripts of Question 4 to Question 6 are in the Appendix F, the following are examples:

“..., I have less enjoyment, comfort level and self-confidence seeking information on portals because every portal has its own system, non-standard web design, and also because sometimes the portals are a little too compartmentalized. For example, I know the information is categorized there and I know some materials were there since I use Google search one time. But when I come back there later, I just can't find or search for things there. Or sometimes I just don't know the way that the portal is organized and sometime the materials on portal are limited. So, using portals is really frustrating...” (No. 5)

“... I don't consider myself to be computer savvy. So if it's too difficult I would tend to not look into that website. Or if it looks like it's not easy to locate the materials that I'm looking for, and/or take too many steps ... that would make me feel uncomfortable...Again, the first time on a website that is unfamiliar to me I began feeling like I don't know about computers and don't know how to get the information from there. So I guess that ... on some websites I just don't feel comfortable. So a website with an ease of finding materials is important to influence my comfort level and self-confidence” (No. 8).

On the other hand, some participants who had positive mastery experiences think of educational portals with a perceived usefulness and perceived ease of use. That is, when the participants were able to find relevant resources they needed on portals that enhanced their positive feeling towards using portals and feel those portals are easy to use. Also those participants had a lot of experience using different portals and always quickly found resources as references to expand teaching materials and enhance teaching.

“I enjoy using educational portals and have positive self-confidence as well. An example of enjoying, the materials are easy to find, look up and applicable to use for my classes ... so there are materials on there for me to use for my students and many examples on their students’ work, with student work, so that's helpful and then there are also materials good for me professionally to develop my own understanding of the national history day programs that helps in making an enjoyable experience” (No. 8).

“... I enjoy looking for materials for my lessons and resources because I'm always amazed at how many new things ... while I'm investigating. To be honest, sometimes I enjoy finding things so much that I find too much that I want to share.... About feeling comfortable, I have positive feeling ... The reason why is because it's very easy to use and I have a lot of experience using different portals. ... I do have positive self-confidence... because I always see the results of how the resources help my students and help me that validate the resources I choosing are good and that makes me feel better about seeking further resources” (No. 5).

Table 27's Incorporating and Reshaping column shows that all of the participants had high self-confidence in incorporating and reshaping resources from educational portals into their curriculum since the participants had to do it routinely for work. The participant No. 1 mentioned, *“I am confident incorporating and reshaping resources from educational portals. I think I have done it for work... I take things ... from those portals”*; and the participant No. 10 said *“I'd say yes I feel positive about incorporating and reshaping resources from portals ... The main reasons are ... I use good technology and have good resources that allow my day to day running of the class to be less stressful”*. Another reason is that the participants believed incorporating and reshaping information from educational portals provided useful resources as references that could expand their teaching materials, enhance their teaching, and/or bring students attention to lessons. The whole transcript of Question 7 is in the Appendix F and the examples are as follows:

“The reason I incorporated information from the portals because I think the information on portals can enhance the courses and give more reading materials/ideas... these resources on the portals are helpful -- give teachers more specific details resources that teachers don't have and expand teachers' lessons” (No. 1)

“I’d say yes I feel positive to incorporate and reshape resources from portal ... Because I can ask students to use the same portals to investigate.... So, incorporating portals and changing the way that resources are presented would allow the students to learn a lot more ... Also using online portals can help teachers enhance and change the way in teaching as well as bring students attention on lessons.....About reshaping because I know what resources I need, I know my students, and I know how to change or reshape the resources so that it fits to my students with their abilities, strengths, and weaknesses. Just kind of knowing the personality of my classes, knowing whether something would work, how to break it down simpler or more difficult based on the situation” (No. 10)

However, there was one participant who pointed out that although she had confidence in incorporating and reshaping resources from educational portals into her own curriculum, she didn’t like to do that. Even though she was willing to use educational portals as information resources, she preferred to create her own curriculum from the beginning.

“I am confident incorporating and reshaping But usually, it would be just easier for me to do it myself from scratch. Instead of reshaping there, it will be easier for me to get some ideas from portals and just do it over from the beginning. Also sometimes I know what I’m looking for and what’s out there, but I just don’t find it. So it just takes too much work, if I am reshaping things” (No. 5)

In Summary, Teachers’ Computer Self-efficacy Strength (TCSS) understand the participants’ emotion and confidence on using computer hardware/software, educational portals, and integrating resources into lesson preparation. It showed that most participants had positive feelings of enjoyment, comfort level, and self-confidence in using computers as well as incorporating and reshaping the resources from educational portals. However, most participants didn’t feel enjoyment, comfortable, and confident when using educational portals. The reasons that influenced the participants’ feelings were failed previous experiences with negative affective arousal. More specifically, most participants had a hard time using educational portals because of the portals’ System Interface, Time Issues, and Content Quality. System Interface and Time Issues –“every education portal always has its own system”, “non-standard web design”, and “was too compartmentalized” which took time to navigate the portal and find resources; and

Content Quality – “the resources on the ICT often changed their location which made them hard to find and to locate relevant resources on later visits”.

(2) The Generalizability of Teachers’ Computer Self-efficacy

Teachers’ Computer Self-efficacy Generalizability (TCSG) is used to understand whether a teacher believes he/she has the ability to use different computer features and educational portals. This study measured the teachers’ computer self-confidence by means of content analysis on the responses to three questions from the Self-efficacy Interview: (Q8_1) addressing various computer issues when using educational portals, (Q9_1) deals with different educational portals’ features, and (Q10) willingness to use a new portal.

Table 28 (below) first shows each question’s result is divided into two groups (confident and not confident) and then displays the results of the Teachers’ Computer Self-efficacy Generalizability (TCSG) that are divided into 3 parts from these questions. Overall, only three participants showed positive confidence for each of the three different domain questions although individually the questions collectively had five participants indicating positive confidence. Four of the participants had at least one negative response in addressing different domains of educational portals in these three questions. The main reasons that influenced the participants’ confidence were their previous mastery experiences with Perceived Usefulness and negative emotional state with Perceived Ease of Use. Transcripts are in the Appendix F: Question 8_1, Question 9_1 and Question 10.

Table 28. The Results of Teachers' Computer Self-Efficacy Generalizability (TCSG)

	Overall report in 3 questions	Addressing various computer issues	Dealing with different portals' features	Using new portals
Confident	N=3 (all responses reflect confidence)	N= 5	N= 5	N= 5
Not confident	N=4 (at least one response reflects lack confidence)	N=2	N=2	N=2

Table 28's Addressing Various Computer Issues' column shows that the finding of Teachers' Computer Self-efficacy Generalizability (TCSG) is that the participants are confident in addressing various computer issues when they use educational portals. There were five participants who had positive confidence and two participants who had negative confidence in addressing various computer issues when using educational portals. The main influences on participants' confidence were their mastery experiences and emotional state. For example, the participants who had previous successful experiences in addressing computer issues believed in their computer technology mastery when using educational portals and thought of educational portals in terms of Perceived Usefulness. As participant No. 9 said *"I feel confident with addressing certain computer issues in educational portals ... if ... I knew that portal has some information I need ... I will do a lot of different searches to try to find the materials"*. Also the participants believed that integrating computer technologies into their daily teachings as routine work since it assisted their teaching success. As the participant No. 10 mentioned, *"...technology (including the Internet and computer) can help us do a lot; ... as teachers, you do everything based on the computer and the Internet. If you don't know how to fix the technology, they would ruin your class"*; and the participant No. 1 said

"I'm confident with that because I deal with computer every day in the school. Computers are integrated very well into our school environment. ... if I was not

comfortable to address computer issues, I won't be able to do my job because there are a lot of times I have to address computer issues" (see the Appendix: Question 8_1) .

Conversely, the participants, who had failed in previous experiences, thought computer software in educational portals was too complicated which aroused their negative emotional state, as the participant No. 8 mentioned, *"... I wouldn't feel confident to deal various computer issues. It is too complicated ... downloading a particular document ... that's not too much of an issue, but ... the issues with computer software [in portals], I have negative confident feeling..."* (See Appendix F: Q8_1). Even though technological support was provided by the school and some participants were not hesitant to seek that support, they still, however, had negative feeling of confidence because they were aware of their limitations.

"I have limited ability to address various computer issues. If it is something I am able to work through, I would attempt it. Also we have three technologists at our school and I would go directly to them and ask for help. So when I won't be able to fix it on my own, I would get additional assistance and try to get help to fix it. I am not hesitant or feel uncomfortable asking for help. But still for dealing with various computer issues, I have a negative feeling of confidence because I know my limitations" (No. 6).

Table 28's "Dealing with Different Portals' Features" column shows there are five participants who had positive confidence and two participants who had negative confidence in dealing with different functions/features when they searched for information in educational portals. The main reasons that influenced the participants' confidence were their mastery experiences and emotional state. That is, the participants who had successful previous experience were confident dealing with different functions/features on educational portals and also had a positive attitude in using different portals' functions/features (e.g. trial and error and having their own search strategies). Also, those participants thought of educational portals in terms of Perceived Usefulness.

“Most of the timeI found most of the educational portals have been designed for simplicity for the teachers, keeping things very simple, very easy to find. So I am very confidence to navigate and look through information on the portals” (No. 3)

“I have my own search strategies to look up information on portals. So different features design doesn’t panic me and I can help myself to figure out a new way around from different and difficult.... So, I still have positive confidence dealing with different ... functions/features in educational portals” (No. 5)

“I like to try out the different functions and see if I can learn from these because many times it will have a better way to find information for your course. For me, to try different functions on portals is just trying to learn the better way to do. It is more like trial and error ...” (No. 10)

Conversely, the participants who had failed previous experiences had negative emotional state when dealing with different educational portals’ features. Once the participants’ negative affective arose, their first impression of using different features on portals was hardly going to change. Also, the participants were more passive in attitude towards using portals since they thought educational portals weren’t easy to use. So accurate, appropriate and/or simply search functions and navigation support in educational portals is important to enhance participants’ confidence of using educational portals.

“I feel less confident dealing with different and difficult functions/features when I search for information in educational portals because I lack experiences ... My first impression makes me lack confidence to seek information on the portals... So I may need more accurate or simply search functions that can present a greater number of results or hints...” (No. 1)

Besides, one participant stated that the participants’ knowledge of subject matter was also an important influence in searching information, as the participant No. 1 said,

“... when I don't really know what specifically I like or look for, I found it difficult to just get a lot of different pieces/resources... and then to pick and choose resources from these. I think that is challenging. For many of us ... [in NCTA Seminar], it was our first experience for exposure to a lot of Asian history. We know enough general historical terms to search, but we are not an expert to know enough specific terms to search. Our knowledge of the subject is not enough” (see Appendix F Q9_1)

Table 28's "Using New Portals" column shows that five participants had positive confidence and two of them had negative confidence in using new educational portals. The main reasons that influenced the participants' confidence were mastery experiences, emotional state, and verbal persuasion. In other words, whether the participants used (or did not use) new educational portals depended on their mastery experience with positive or negative affective arousal. For example, the participants with positive previous experiences possessed an active attitude in trying new portals.

"Yes, the reason for me to enjoy a new education portal, such as Asia for educator, because I had a course that used many of its resources from that portal and everything I used from there it is research, it's valid, it has success with students, and It helps me learn....Also, if I hear about something new or maybe someone gives me a link, then I would try it. So the good experience from before are enhancing the self-efficacy and making me willing to try the new portals" (No. 10).

Conversely, the participants with failed previous experiences had negative affective arousals and preferred to ask colleagues before trying a new portal and/or preferred using general search engines, e.g. Google, over educational portals.

"According to previous experience, I would like to go to a colleague first. If a colleague says that you can get materials you want on this topic from so-and-so, I will go to the portal even though it is a new portal. And I would be more confident to work on this new portal. But I think on my own, I would say I am not that confident. However, if this involved a person guiding me, and/or a person's suggestion would make me more confident. It will enhance my confidence" (No. 1)

"Overall, I feel very comfortable with using new technology; I think the reason why I do so much web searching is because I have a passion to want to learn more, and that's why it develops my confidence is because I find something that interests me" (No. 3).

In addition, one participant pointed out the reason that made him have a higher computer self-efficacy was because he was "Born Digital", which meant those who were born into and raised in the digital world. So he was born with technology around and interacted with

technology all his life. But once he gets old and if technology has changed in some way he couldn't use, and he would feel less confident in dealing with computer technologies.

“One other reason that I am with higher computer self-efficacy is because I was born with technology around and I am interactive with technology. ... However, I think I will feel less confident when I get older, to be honest, and see how technology has changed in something that I'm not used to...” (No. 10)

In summary, TCSG shows that the main reasons that influenced the participants' confidence were their mastery experiences with Perceived Usefulness and negative emotional state with Perceived Ease of Use. That is, the participants who had successful previous experience believed in their own computer abilities with educational portals and were more active/willing (through trial and error methods) to address different issues on educational portals in order to find useful resources for their teachings and thought portals would assist their teaching success. Conversely, the participants who had failed previous experiences thought educational portals were too complicated to deal with and lacked a Perceived Ease of Use which arouses their negative emotional state. Once the participants' negative affective arose, they had limited resources to address different issues when using educational portals even though the school may have had technical support.

(3) The Magnitude of Teachers' Computer Self-efficacy

Teachers' Computer Self-efficacy Magnitude (TCSM) seeks to understand whether a teacher believes he/she has the capability to accomplish difficult tasks associated with computer issues and educational portals. This study also included 3 questions to assess Teachers' Computer Self-efficacy Magnitude: (Q8_2) addressing unexpected computer issues when using educational portals, (Q9_2) dealing with difficult functions/features in educational portals, and (Q11) willingness to keep trying to find resources on portals. Table 29 shows that each question

result was divided into two groups (confident and not confident) and then displays the results of the TCSM that are divided into 3 parts according to those questions.

Table 29. The Results of Teachers' Computer Self-Efficacy Magnitude (TCSM)

	Overall about 3 questions	Addressing unexpected computer issues	Dealing with different portals' features	Keep trying to use educational portals
Confident	N=2 (all responses reflect confidence)	N= 3	N= 3	N= 4
Not confident	N=5 (at least one response reflects lack of confidence)	N=4	N=4	N=3

Overall, the participants (N=5) had at least one negative response in dealing with different domains of educational portals, since there were only two participants (N=2) who had positive confidence with all 3 questions in the TCSM (Table 29). The main reason that influenced the participants' confidence was failed pervious experiences which aroused their negative affective state which led to a passive attitude in using educational portals and to rely on their colleagues instead. Transcripts are in the Appendix F: Q8_2, Q9_2 and Q11.

Table 29's "Addressing Unexpected Computer Issues" column shows that more participants had negative confidence than positive confidence in addressing unexpected computer issues when they use educational portals since four participants had negative confidence and three of them had positive confidence on that. The main reasons that influence the participants' confidence were their mastery experiences and emotional state. That is, the participants who had successful previous experiences with positive affective arousal believed in

their self-computer capabilities, like using trial and error to solve the questions they encountered, and saw students as a great computer resource.

“Although sometimes I'm frustrated, I still feel pretty confident and pretty positive to address unexpected computer issues when using educational portals because, quite honestly, ... the kids would help me to fix my computer issues. The kids grow up with computers and are much more technicalSo the kids that I am teaching are the great computer resources for being able to help me with technology” (No. 3)

Conversely, the participants who had failed previous experiences thought unexpected computer technologies could ruin their class and they were fearful of making mistakes in front of their students. Also the participants who had negative affective arousal would easily give up solving difficulty computer problems when they used portals.

“For dealing with unexpected issues, I would also have negative confident feeling with that because when you feel you already prepare everything, you find something unexpected happens during the lesson, and then you stand in front of the students who may know more about computers than you. I think it would make me feel panicky at that moment. So I think I have had to learn to swallow a bit of pride and often times students know how to figure out (the troubleshooting) with computer issues and tell me what I could do since they are “born digital” and I am an immigrant” (No. 8)

Table 29's “Dealing with Difficult Portals’ Features” column shows that the participants had negative confidence in dealing with difficult functions/features on educational portals. That is, four participants had negative responses and three participants had positive confidence in dealing with difficult functions/features on educational portals. The main reasons that influenced the participants’ confidence were also their mastery experiences and emotional state. For examples, the participants who had successful previous experience felt confident in solving difficult functions/features in the portals and also considered it worthwhile to solve the problems in order to get useful content from the portals. In other words, educational portals were perceived as useful to the participants. As the participant No. 10 said, “... once I am successful,

I got more confident with the content and the way to access portals. Obviously, it's important to be able to access the content”.

Conversely, when the participant had failed in previous experiences, their negative emotion aroused from the first time when they used an educational portal and/or they had a passive attitude towards searching on portals and thought it was waste time.

“When I searched for information on educational portals... because lack of experience ..., I feel less confident dealing with difficult functions/feature because I had difficulty finding information and my first impression makes me lack confidence to use portals. ... But, I think even if these portals would be improved, my first experience would not be, and it was not positive” (No.1)

The last finding of *Teachers’ Computer Self-efficacy Magnitude (TCSM)* is to identify those participants who would keep trying to use educational portals until they found the resources they needed (Table 29 above). The result shows that four participants had positive confidence and three of them had negative confidence to keep trying to use educational portals until they found the resources. The main reasons that influenced the participants’ confidence were mastery experiences and emotional state. In other words, when the participants had positive previous experiences in using educational portals, they believed that educational portals were useful. So they had an active attitude (trial and error) to keep trying to find resources on educational portal in order to complete the job, to obtain the resources needed.

“Yes, if I know specifically a portal wit good quality, I will start with that portal, not Google search, since Google search has so much junk you have sift through. So I will do a lot of different searches on portals to try to find the materials” (No. 6)

Conversely, the participants who failed in previous experiences had negative affective arousals that led to a passive attitude in finding resources on portals and relied on colleagues and/or liked to search with general search engines instead.

“... because of my previous experiences, I would go to a teacher who is an expert on the topic or somebody older with more experience that also are teachers in the same course, and ask him/her whether s/he had done any lessons related to this topic. Or, I would just go to the broad internet e.g. Google or some other search engine to see what's out there or what other teachers posted on the Internet about the topics. So I would come to an educational portal through another person or through general search engines” (No. 1)

In summary, Teachers' Computer Self-efficacy Magnitude (TCSM) focuses on the participants' confidence in dealing with difficult domain issues when using educational portals. It shows that the participants, who had successful previous experiences and believed in their computer capabilities, believed that portals always provided useful resources. They also thought that it was worthwhile to solve difficult issues in order to get useful resources to complete the job. On the other hand, the participants with failed previous experiences that arouse their negative affective state exhibited a passive attitude in using educational portals and thought that using educational portal would ruin their class, and relied on their colleagues instead.

The findings from RQ2-5 show that prior mastery experience is an overall indicator of a successful-educational-portal user which come with a history of being able to find relevant resources on educational portals; and negative affective state is a primary indicator of a frustrated educational portal user which goes together with not having had an easy to use experience for educational portals. Additionally, the participants' confidence in using different domains of computer technologies (Teachers' computer self-efficacy generalizability) is an indicator of the participants' Perceived Usefulness of educational portals and their actual portal usage. Of course, mastery comes from an experience, which then leads to more usage and more mastery; this cycle is probably related to the ability to learn from frustrations in a trial and error approach.

In addition, the Born Digital participants are more willing to use educational portals; conversely, digital immigrants are more passive about using them. The participants' subject

matter knowledge and other verbal persuasion (e.g. colleague and/or students persuading) could be important reasons that influence the participants' actual usage of a portal, particularly when they intended to use a new portal.

5.4 DISCUSSION

5.4.1 Main Finding

The Acceptance Study aimed to explore what variables influence K-12 teachers' acceptance of educational portals. Based on the results obtained in the Acceptance Study, I created a model (Figure 25) to express the relationships among K-12 teachers' five variables, their information seeking behaviors, their acceptance of educational portals and their actual usage of them. The Figure 25 below shows: (1) teachers' confidence of using different domains of computer technologies (Teachers' Computer Self-efficacy Generalizability) is associated with their Perceived Usefulness of the resources; (2) teachers' Perceived Usefulness is related their Actual Usage as well as their Information Needs; (3) teachers' background is significantly related to their Perceived Ease of Use as well as the variables: system interface and time issues.

The five major findings in the Acceptance Study are:

1. K-12 teachers' backgrounds (i.e. gender, age, and higher degree, teaching years, the use frequency of education portals) should be considered when designing a specific subject educational portal for them. In particular, these personal background factors influence one's Perceived Ease of Use.

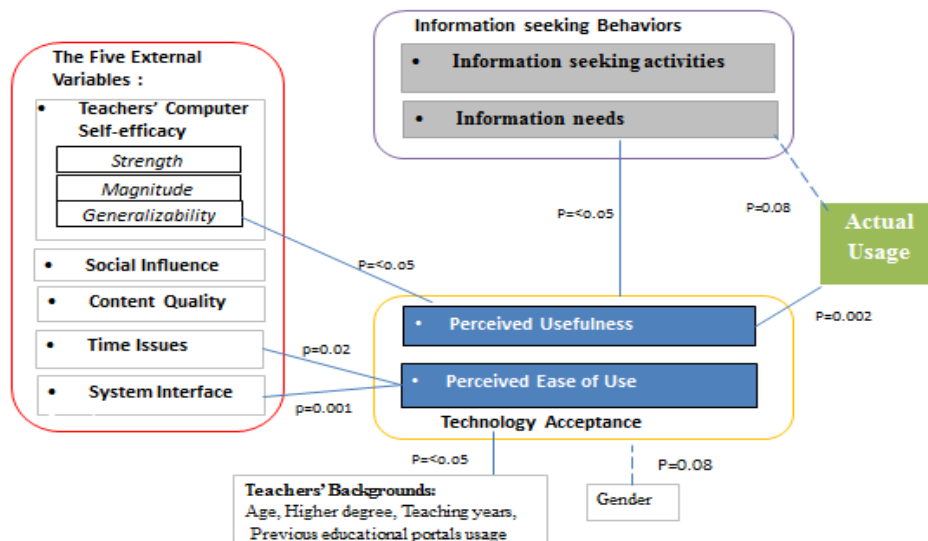


Figure 25. The Model of the Acceptance Study

2. K-12 teachers, when using ICT, first will try general search engines (i.e. Google), then will try searching on relevant educational portals, and finally try a specific portal like EAGLE. Even though teachers believed that educational portals provided high quality content, they had more confidence in searching from general search engines than dealing with different educational portals' system interface. Therefore, they still preferred to use general search engines as the starting point unless they know specific portals that have provided relevant resources in the past.

3. K-12 teachers are concerned with Perceived Usefulness more than Perceived Ease of Use when they think about using educational portals. For example, the Perceived Usefulness was directly related to whether K-12 teachers thought they could find relevant information on educational portals before they even actually used a particular portal. Thus, having relevant resources and continually updating those resources with new sources encouraged teachers to use the portals.

4. When K-12 teachers' actual search through portals, System Interface and Time Issues were two important variables that significantly directly influence teachers' Perceived Ease of Use. In this vein, having a positive Perceived Ease of Use portal becomes necessary to enhance K-12 teachers' confidence in using the portal and to minimize their time limitation issues.

5. Teacher's Computer Self-efficacy is a catalyst that changes K-12 teachers' information behaviors when using educational portals. That is, K-12 teachers believed that using computer technologies became a part of their teaching capability and it could enhance their teaching, save time, and facilitate completing their tasks. So, K-12 teachers had positive feelings about performing tasks with computer technologies and they have integrated computer technologies into their lesson preparation. But when using educational portals, K-12 teachers' previous experience of using portals was an important influence on their Teachers' Computer Self-Efficacy (TCS). For example, K-12 teachers who had successful previous experiences would be more active and willing to use trial and error to find useful information from educational portals. Conversely, K-12 teachers, who had negative previous experience with negative emotional arousal, would display a passive attitude in using educational portals and/or rely on their colleagues. Additionally, K-12 teachers' experienced positive or negative affective arousal because of their successful or failed previous experience of using educational portals which they associated with the Content Quality, System Interfaces, and Time Issues that were experienced on the portals. This is TCS cycle in which positive experiences lead to more positive perceived usefulness which leads to more actual usage (Figure 26).

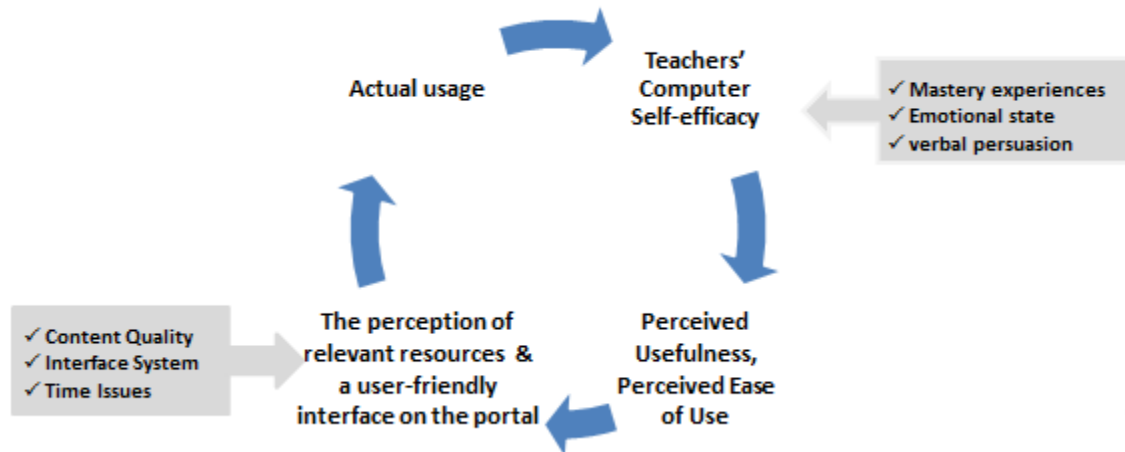


Figure 26. Teachers' Computer Self-Efficacy (TCS) Cycle

In summary, teachers positively appraised the content quality that is provided on all kinds of portals. But when teachers use portals, they want instant gratification in finding relevant content to support their teaching. Thus, if a portal has proven relevance, that definitely would increase the teachers' willingness to use that portal. Conversely, if it is not an easy to use system (e.g. appropriate search navigation, grouping/highlighting of information, and screen displayed standardization), that would reduce the teachers' confidence in searching through that portal. Also, a teacher who has a Perceived Ease of Use about educational portals would be more willing to try to find relevant resources which enhances his/her Teachers' Computer Self-efficacy and perceived usefulness of a portal.

5.4.2 Limitation of Study

There are two limitations to this study. First, we need participants in various fields to understand teachers in other areas. In the Factor Study, all of the participants were NCTA alumni who have an account on the EAGLE and majored in Education or Arts and Sciences; and the

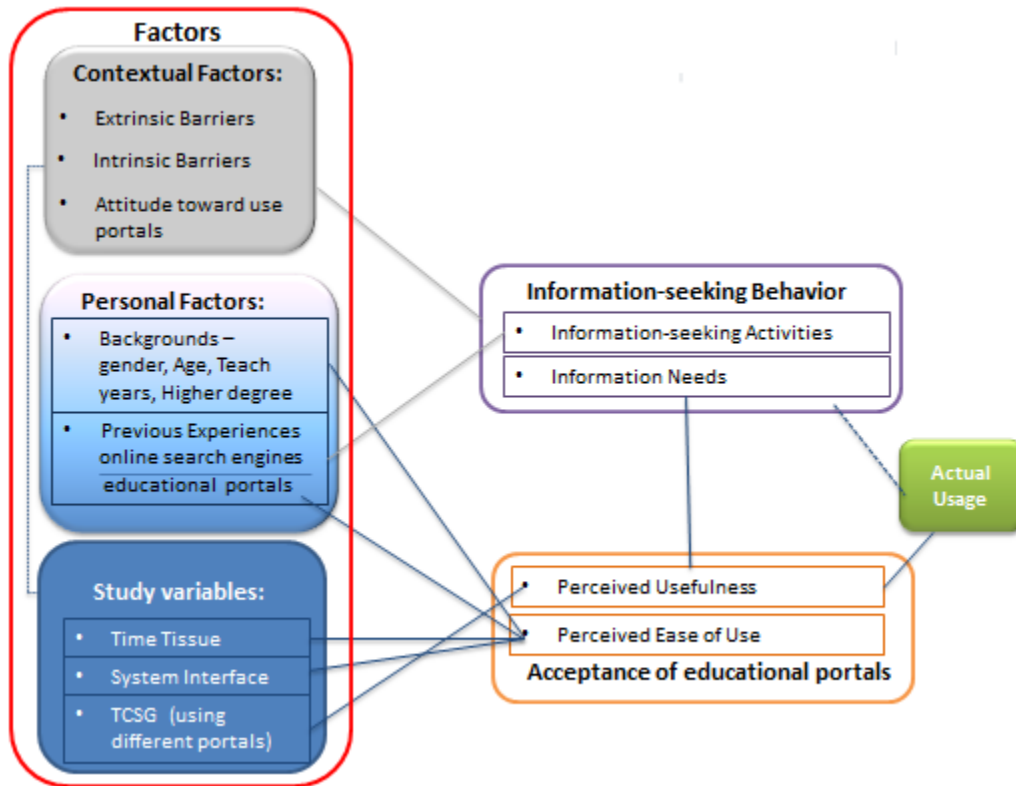
majority taught history and/or social science courses in K-12 schools. Second, although this study provided a mixed-methods approach to cross check the results, the small number of the participants who participated in the survey limited the statistical power of the analysis. This study only had 12 participants in the first interview and 7 of them continued for the second interview. The results may be biased because of the sample size. So based on the interview results, it would be better if I could have conducted them with more participants to verify and validate the interview results.

6.0 DISCUSSION AND CONCLUSION

This section begins with a discussion of the study in section 6.1 followed by a discussion of its implications; followed by a study summary in section 6.2 and future work is outlined in section 6.3.

6.1 DISCUSSION AND IMPLICATION OF THE STUDY

This dissertation focuses on several aspects of teachers' personal background, cognitive activity, emotions, feedback of information environments to discover the main factors that influence the K-12 teachers' information behaviors. This section, as opposed to the presentation in sections 4.3 and 5.4, integrates the findings from the two studies – the Factor Study and the Acceptance Study – to extend the interpretations and to provide insights into the phenomena in order to further answer the research questions. It first shows the statistical relationship between the factors of K-12 teachers and their information behaviors from the aforementioned two studies (as shown in Figure 27), then interprets the phenomena identified from the research results and also shows the implication for the areas that study K-12 teachers information interactions.



The grey lines indicate the results from the Factor Study and the blue lines indicate the results from the Acceptance Study. The dashed blue line indicates a marginally significant statistical relationship. The solid lines indicate statistically significant relationships

Figure 27. Main Findings from the Two Studies

1. The statistical relationship between the factors of K-12 teachers and their information behaviors

Figure 27 (above) shows the main findings from the two studies: (1) K-12 teachers' personal Background and Previous Technological Experiences affect teachers' Acceptance via Perceived Ease of Use which then influences Actual Usage in educational portals. However, these personal factors of K-12 teachers do not influence their Information-seeking behaviors. Only K-12 teachers' Previous Technological Experience using online search engines affect their Information-seeking Activities. (2) K-12 teachers' Contextual Factors (Extrinsic Barriers,

Intrinsic Barriers and Attitudes) influence their Information-seeking Behavior via Information Needs and Information-seeking Activities. (3) There is a significantly relationship between K-12 teachers' Information Needs and Perceived Usefulness. Also, K-12 teachers' Actually Usage of educational portals depends on their Information Needs and their Perceived Usefulness of educational portals. (4) K-12 teachers' Perceived Ease of Use is significantly affected by their Background, Previous Experience of Using Educational Portals, System Interface, and Time Issues when using educational portals; (5) K-12 Teachers' Computer Self-Efficacy Generalizability (TCSG) influences their Perceived Usefulness.

2. The interpretation of the phenomena identified from the research results

As shown in Figure 27, besides individual background, this dissertation found that a better model of K-12 teachers' information behaviors on using educational portals has to be concerned with K-12 teachers' previous technological experience, their feelings and perceptions of using educational portals, and portals' system interface design. Also the findings showed that there is a divide that separates those teachers who are willing to use portals and those teachers who do so only hesitantly. This section points out three issues that should be addressed: (A) how to make portals useful for those K-12 teachers who are willing to use them; (B) how to provide support for those teachers who were not "born digital" and willing to use educational portals; and (C) how to support those K-12 teachers who lack confidence to explore the portals independently.

A. How to make the portal more useful to these K-12 teacher who are willing to use them

To make the portal more useful to these K-12 teachers who are willing to use them, the results from the *RQ1-2*, *RQ2-2*, *RQ2-3* and *RQ2-4* guided us to be concerned with two issues:

updating resources more frequently and providing an adequate system interface to decrease time consumption in the educational portals. According to the findings from the *RQ1-2*, both barriers (extrinsic and intrinsic) of K-12 teachers play an important role that influences their attitude when they seek information on educational portals. More specifically, K-12 teachers are concerned with interface design, time consumed in preparing lessons when using educational portals, and content quality and relevance. Then the results from the *RQ2-2* and *RQ2-3* showed instead of using educational portals, K-12 teachers are more likely to search with general public search engines (e.g. Google) because they think educational portals lack an intuitive system interface, lack frequent updating with new information, and/or cost too much of their time for learning/searching through the portals. Also, *RQ2-4* showed that a well-organized portal should provide intuitive and ease to use navigation aids and user-friendliness should include a simple and adaptive search function to assist teachers to search for resources through educational portals. Otherwise, K-12 teachers may consider that those portals do not provide relevant resources they need. Thus, updating resources more frequently and providing an adequate system interface to decrease time consumption in the educational portals are two issues that should be considered in order to make the portals more useful for K-12 teachers.

Concerning resource updates, K-12 teachers pointed out they are willing to use educational portals that keep updating resources frequently. As the participant No. 5 said, *“I am looking for something new, materials (relevant information)...”*, and the participant No. 1 mentioned *“there was not a lot content ... on portals.”* Concerning an adequate system interface, a portal with a well-organized and user-friendly interface supports K-12 teachers using educational portals by saving time, making it easy to find accurate resources, and being less likely to be misjudged about the usefulness of portals. Additionally, when designing educational

portals, the three important features – Grouping/ highlighting of information,” “Navigability,” and “Relevant content/resource” – should be areas of focus in order to make portals more useful for K-12 teachers’ to support their lesson preparation. Therefore, this study recommends the following four steps to make the portal more useful to K-12 teacher who are willing to use them.

- First, a portal should provide simple, direct, and quick access to web/search navigation that assists K-12 teachers intuitively with easy to find resources that they want. Conversely, a hidden search functions or inappropriate web organization on a portal confuses teachers when attempting to use that portal and makes that portal seem less useful. Also, having an adaptive search function on a portal with subject/image categories provides a clear conceptual framework and visually organized data saves teachers’ time when attempting to find resources. As the participant No 4 said *“the well-organized designed educational portals have a fairly simple home page”* and *“the user-friendly thing is that search bar has delineated subject matter...”*

- Second, having a clear Grouping/Highlighting of Information is important for a well-organized and user-friendly site that supports K-12 teachers to seek information on a portal. In other words, the feature of Grouping/Highlighting of Information helps K-12 teachers easily read information, by avoiding clutter and confusing design of different subjects/resources. As the participant No. 9 said, *“... having actually specific information highlighted ... is my first consideration as a well-organized portal.”* Also the participant No. 5 mentioned *“I think well-organized [sites] ... see the different materials (photo, films, books, literature, and news of a country) and different levels sources (lessons & activities and young adult & children) there, and “the user-friendly portal should...bundle many resources and highlight them into small information [groups] ...”*

- Third, having a well-organized web site and user friendly search navigation also makes K-12 teachers less likely to be confused and to misjudge how to find relevant resources on an educational portal. As the participant No. 5 said that *“I think it is always harder to find the information on a portal although I know the article is there... since portals are harder to navigate... ”*.

- Fourth, concerning the system interface from *RQ2-2 and RQ2-5*, K-12 teachers don’t want to learn a whole new interface for each portal. They want to be able to use what they already know about computers and web searching from, for example, Google or Bing. As participant No.1 mentioned, *“I prefer to go online to use search engines as a starting point to find specific materials/resources.”* Thus, to let K-12 teachers use the skills that they have learned from Google and Bing on the portals, without just been more limited version of general search portals, is an important design goal; to provide a standardization portal design that facilitate K-12 teachers to easily recognize content and to search resources for their lesson preparation; and to provide the features of communication and feedback channel that enable K-12 teachers to acquire up-to-date information from the portals.

However, opinions about Content Quality and Social influence are not related to the dependent variables, Actual Usage, Acceptance, and Information-seeking Behavior. The *RQ2-2* and *RQ2-3* also showed that all K-12 teachers believe that portals have provided quality information and would like to use educational portals which provided many relevant resources to fit their curriculum settings and subject norms needs. In other words, K-12 teachers who either use or not use educational portals are concerned with these two variables. For example, K-12 teachers in the Acceptance Study pointed out that one of benefits for using educational portals was that almost all educational portals provide high quality information that is reputable and

reliable. As the participant No. 4 said that “educational portals streamline and provide safe/reliable content” and the participant No. 10 mentioned “*the reason I don’t feel unconfident with ... the portal [is] because I trust the portal since there is some kind of quality and some kind of credentials behind the portals.*” Then the RQ2-2 showed that all K-12 teachers point out that the reason they use (or not use) an educational portal for lesson preparation is whether they can find relevant resources from educational portals. As participant No. 2 said “*as a teacher, I’m always trying to find relevant resources to support my curriculum design.*” This is similar to Social Influences. K-12 teachers point out that they are concerned with Social Influences (i.e. curriculum settings and subject norms) when they search or not search through educational portals. As the participant No. 9 mentioned “*the reason I use educational portals is to plan out a whole unit of study before I start teaching;*” and the participant No. 8 said “*the Curriculum that is [already] set would be the reason not to use the portal.*” Therefore, Content Quality and Social influence are not open issues.

B. How to provide support for those teachers who are not born digital and willing to use educational portals

For K-12 Teachers who were not “born digital”, according to the findings from the RQ1-1 and RQ2-1, teachers’ age, years of teaching and prior educational technologies are three factors that simultaneously affect teachers’ Information-seeking Behavior and Acceptance of educational portals. In particular, the RQ1-1 shows that K-12 teachers’ age and their years teaching experiences have a negative association with their extrinsic barriers (i.e. limited access to computer technology because of inadequate interface design, lack adequate support, or time-consuming for taking too much time to learn the portals). This is similar to the results findings from the RQ2-5, the “digital immigrants” K-12 teachers are more passive about using

educational portals; conversely, “born digital” are more willing to use them. As the participant No. 8 mentioned that she has negative confidence dealing with problems of computer and educational portals because she is a “digital immigrant”. Conversely, the participant No. 10 felt comfortable with these problems because he had grown up with computers in his whole life, but he mentioned he will [probably] feel less confident when technology has changed into something that he cannot use.

Having prepackaged lesson units/video tutorials, or to have third-party people that provide help on how to use the educational portals support K-12 teachers who are not “born digital” to use educational portals is seen as an effective means to incorporate the digital immigrants into the digital world. As the participant No. 1 mentioned “... *if there is a training course or some directions from the authority (portals’ designers/instructors) that are in charge to show how to use and teachers, as users, can practice and get some support and help along with*”, and “*if this involved a person guiding me, and/or a person’s suggestion would make me more confident. It will enhance my confidence.*”

C. How to support these K-12 teachers who lack confidence to explore the portal independently

To support these K-12 teachers who lack confidence to explore the portal independently, it is important to always make their TCS cycles be positive. According to findings from the *RQ1-1 and RQ1-2*, K-12 teachers’ Extrinsic Barriers and Intrinsic Barriers are two factors that influence their Attitude and Information Needs when they seek information on educational portals. In particular, K-12 teachers’ Intrinsic Barriers influence teachers to believe or to have confidence using educational portals. The *RQ2-5* also found K-12 teachers’ confidence (or lack of confidence) using computer technology comes from the cycle of the Teachers’ Computer Self-

Efficacy (TCS). The negative cycle of the TCS leads K-12 teachers to not believe in their abilities and to lack confidence using computer technology as the *RQ2-5* showed. Thus, to make K-12 teachers believe that using educational portals is worth the effort should be concerned with these two issues:

- K-12 teachers had a hard time to search through portal. As the participant No. 5 said “*I have less enjoyment, comfort level and self-confidence seeking information on portals because every portal has its own system, standard web design, and also because sometimes the portals are a little too compartmentalization*” and the participant No. 6 pointed out “*... each portal has different interface design which makes me need to sort through. These make me uncomfortable and lack confidence.*” Thus, it is important that portals provide a standard interface and not a compartmentalized system interface which would support K-12 teachers to navigate and/or to find relevant resources more easily.

- K-12 teachers had a hard time to find relevant content they needed because portals or ICT often changed their location. As the participant No. 1 said, “*If I have difficulty finding resources, if I don't find them right away, I think I get frustrated and I give up*”, and the participant No. 9 pointed out “*the reason I don't enjoy ... resources changed very often on the Internet.*” Thus, it is important to help K-12 teachers find and later to find again resources on the portals.

To support these K-12 teachers who lack confidence into the positive cycle of TCS is important since it is the positive cycle of the TCS that includes K-12 teachers' mastery experiences, emotional state, and verbal persuasion which influences the teachers' Perceived Usefulness and Perceived Ease of Use for educational portals, which influences their ability to successfully use educational portals, which influences their perception of there being relevant

resources on the portal, having a user-friendly interface on the portal, and willing to spending effort on the portal, then which leads to a positive mastery experience, a positive emotional state.

3. The implication for the areas that study K-12 teachers' information interaction

This dissertation uses a holistic perspective to explore K-12 teachers' information behaviors when teachers use educational portals as information resources for lesson preparation. As discussed above, K-12 teachers' experiences, perceptions, feelings, and the educational portals' interface are all factors that affect teachers' information behavior identified by my study. This dissertation also introduces a new direction that impacts K-12 teachers' information interaction in these areas: Human Computer Interaction (HCI), Educational and Instructional Technology design, research librarianship and museums.

HCI research is more concerned with the system implementation between people and computers than with human's feelings or perceptions. So, the findings of this study focus not only on professionals' Perceived Ease of Use of the system interface but also highlights professionals' information needs and affective state. These are important features that support the system design particularly for K-12 teachers' educational portals.

Conversely to HCI, the study of Educational and Instructional Technology is concerned with providing professionals with specific knowledge of teachers' information needs. The results of this study found that users' Perceived Ease of Use in interface design is an important factor that influences their information behaviors when using educational portals. The results of this study also can support educators and instructional technologists to get a clearer idea about how to design appropriate professionals' interface based on the users' pervious experiences and the features of system users are concerned with. Additionally, the findings from this study impact the educational domain by influencing teachers' perception of using educational portals.

Understanding the positive TCS cycle helps educators to develop their information seeking skills. The positive TCS cycle is also an important area of focus for information specialists designing educational portals.

Research library professionals and museum personnel are two roles that service public users. More specifically, K-12 teachers like to seek information from digital libraries to support their teaching (Limberg and Sundin, 2006). As well as K-12 teachers in social studies areas like to use the portals that are provided by museums or other cultural heritage institutions to extract information. For example, K-12 teachers, in this dissertation, grouped museums, cultural heritage sites, and EAGLE together to access and to pull out useful resources when discussing their computer search experiences. So the findings of this dissertation shows the teachers' perception, teachers' barriers, attitudes, and information-seeking behavior that can help library professionals and educators in museums and cultural heritage areas to understand how to provide more useful resources and easy to use portals for K-12 teachers.

6.2 STUDY SUMMARY

This study was conducted to find the factors that influence K-12 teachers' information-seeking behavior and their acceptance of educational portals for lesson preparation. The first part of this study is called the Factor Study, which used the Information Seeking model – “Task Complexity” – to explore whether the six important factors (i.e. Background, Prior Technological Experiences, TPACK, Extrinsic Barriers, Intrinsic Barriers and Attitudes) influence K-12 teachers' information-seeking behavior. The second part of the study then (the Acceptance Study) merged the Technology Acceptance Model (TAM) with five variables (i.e.

TCS, Time Issues, Social Influences, System Interface and Content Quality) to investigate what causes K-12 teachers to accept or reject using educational portals as a generic concept and certain specific educational portals (such as EAGLE). This study addressed two main research questions in each sub-study:

- **The main research question for the Factor Study:** Which factors critically influence K-12 teachers' information-seeking behavior when teachers seek information from educational portals to be incorporated into course design? (The six factors are Background, Prior Technological Experiences, TPACK, Extrinsic Barriers, Intrinsic Barriers, and Attitudes.)

- **The main research question for the Acceptance Study:** What characteristics influence K-12 teachers' acceptance of educational portals as information resources for lesson preparation? (The five variables are Teachers' Computer Self-efficacy, Time Issues, Social Influences, System Interface, and Content Quality.)

The goal of this study is to develop a model that can guide educators and instructional technologists in building effective educational portals that meet teachers' specific information needs for their teaching preparation. This study addresses these research questions with a mixed-method approach by collecting two data sets including two online questionnaires (Factor Survey and Acceptance Survey Questionnaire) and two one-on-one interviews (Acceptance Survey Interview and Self-efficacy Interview). The Factor Survey and Acceptance Survey Questionnaires were included with single and multiple choices and short answers; and the Acceptance Survey Interview and Self-efficacy Interview lasted around one hour each, audio recorded, and transcripts made from the recordings. The data was analyzed in three ways: (1) descriptive statistics to describe and summarized main features from the data; (2) statistics to understand the relationship between data items that included Fisher Exact Test, Factor Analysis

and Linear Models; and (3) content analysis to accurately obtain more information from the participants to support the results.

In content analysis, I used four approaches to analyze and report the data (1) deductive approach as a *directed content approach* to follow a priori code sets; (2) inductive approach as grounded theory to observe a phenomenon from the data set and merge the new codes/themes into the a priori code set; (3) *summative content approach* to summarize observations into categories by keywords and semantics; and (4) quoting the participants' transcripts as examples to explain these observations and statistics. Moreover, to cross-check and figure out whether K-12 teachers' acceptance of general educational portals is different from specific subject portals, this study used EAGLE as a case study along with specific items from four other portals.

Finally, I present the findings and discussions of these two studies in Chapter 4, Chapter 5, and Section 6.1 to assist educators and instructional technologists to design educational portals that meet K-12 teachers' specific needs for obtaining necessary information. According to the main findings of this study, four key elements have been proposed to develop a model that guides educators and instructional technologists in building effective educational portals and meet teachers' specific information needs for their teaching preparation:

(1) Personal background and contextual factors: Teachers' background (i.e. gender, age, teaching years, and higher degree), prior technological experiences, extrinsic barriers, intrinsic barriers and attitudes) influences information-seeking behavior and their acceptance and usage of specific educational portals, like EAGLE. Additionally, individual attitude is a major factor impacting teachers' seeking information from educational portals to be incorporated into course design.

(2) Users' perception of usefulness and ease of use: K-12 teachers' Perceived Usefulness is an important factor that influences their acceptance of educational portals; however, when K-12 teachers actually use portals, their Perceived Ease of Use becomes a more important factor.

(3) Interface design and time issues: All teachers in the study are concerned with Content Quality and Social Influence when using educational portals; there is no difference in their attitudes between teachers who easily use educational portals and those that don't. The main factors that influence K-12 teachers' acceptance of educational portal are System Interface which goes together with Time Issues that depend their experience of educational portals as having a well-organization design, a user-friendly interface, and up-to-date resources presented.

(4) Teachers' Computer Self-efficacy (TCS): There is a TCS cycle that includes K-12 teachers' mastery experiences, emotional state, and verbal persuasion which influences the teachers' perceived usefulness and perceived ease of use of portals, which influences their ability and willingness to use portals, which influences their perception of there being relevant resources on the portal and having a user-friendly interface.

6.3 FUTURE WORK

"Teachers integrate technology in different ways" (Teo et al., 2008, p164). So a total understanding of those factors that influence K-12 teachers' information-seeking behavior and acceptance of educational portals can benefit the design of appropriate portals for K-12 teachers. This study is a holistic perspective to explore K-12 teachers' information behaviors on using educational portals. It shows that a better model of K-12 teachers' information behaviors on using educational portals should be concerned with K-12 teachers' previous technological

experience, their feelings, their perceptions and the system interface design. The future work for extending the investigations from this study includes:

- To verify and validate the results from the Acceptance Study (the second study) by having a larger sample size and diversity of participants' backgrounds.
- According to the findings, to rebuild the system interface of EAGLE and test it with a group of subjects to see whether new design can enhance teachers' engagement.
- To have a mark-up or actually built educational portal in other subject areas to see whether the findings of interface design can also apply to other subject areas. The basic design principles of the mark-up and the actual test educational portals would use TAM as the theoretical foundation and focus on Perceived Ease of Use for the system interface based on the findings of this study. Although having accurate and useful content on a portal is indispensable, K-12 teachers would be more concerned with system interface; whether it is easy to use and how much time is required to be spent on a portal when actually learning to use that portal. Thus, the mark-up or actually built educational portal will emphasize the system interface design, particularly, to implement simple and adaptive search navigation features, to group and highlight information, to integrate standardization interface design and communication channel and feedback features.
- To study the relationship between K-12 teachers' TPACK and acceptance of educational portals. Whether teachers' technological knowledge, pedagogical knowledge and content knowledge are significantly connected with teachers' acceptance of educational portals.
- To conduct a larger study to understand more deeply the relationship between teachers' computer self-efficacy and acceptance, to discover K-12 teachers' motivation and

affective state when using educational portals, and to explore ways to move users from the negative TCS cycle to the positive TCS cycle .

APPENDIX A. FACTOR SURVEY

KEY FACTORS INFLUENCING K-12 TEACHERS' INFORMATION-SEEKING BEHAVIORS IN EDUCATIONAL PORTALS

The National Consortium for Teaching about Asia's *East Asia Gateway for Linking Educators* (EAGLE; <http://noborders.ucis.pitt.edu/eagle/>) (formerly: the NCTA Teacher Portal) is designed to help K-12 teachers incorporate East Asia into their classrooms. The purpose of this survey is to examine what factors will affect K-12 teachers' information needs and also their search behaviors on using educational portals for teachers. Your answers to the following questions will help us to understand teachers' information needs as well as enhance our portal. Thank you very much.

- Q1. Gender (for demographic purposes only): ☐ Male ☐ Female
- Q2. Age: ☐ ≤ 29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 +
- Q3. Highest Degree Earned: ☐ Bachelor ☐ Master ☐ Ph.D
- Q4. Major of Highest Degree (please type whole name of your major): _____
- Q5. How many years have you been a teacher? _____
☐ 1-5 ☐ 6-9 ☐ 10-14 ☐ 15-24 ☐ 25 +
- Q6. Current Grade(s) taught: (If you are retired, please click the level(s) you used to teach)
☐ PK- 4 ☐ 5-8 ☐ 9-12 ☐ College
- Q7. Current Subject(s) taught:
☐ World History/ Culture ☐ World Geography ☐ World Literature ☐ Social Studies
☐ Global Studies ☐ Arts ☐ Language (specify): _____
☐ Other (specify) _____
- Q8. Do you have internet access at home? ☐ Yes ☐ No
- Q9. Are you able to access the internet at school? : ☐ Yes ☐ No
- Q10. Do you think your school provides/ supports enough technology/ equipment for you (teachers) to incorporate into your teaching? ☐ Yes ☐ No
- Q11. How often do you use technology to supplement your teaching?
☐ Several times per class ☐ At least once per class
☐ A few classes per week ☐ Less than once a week ☐ Never

Q12. How would you rate your own ability to address various computer issues e.g. downloading/ uploading to internet, install programs/plugin-ins?

☐ Very dissatisfied ☐ Dissatisfied ☐ Neutral ☐ Satisfied ☐ Very satisfied

Q13. As a teacher, how often do you use online search engines (e.g. Google, Bing, etc...) to find teaching resources to support your curriculum/ teaching design?

☐ Never ☐ Less than once a week ☐ A few times per week

☐ At least once per day ☐ Many times per day

Q14. Have you ever used any educational portals for teachers (besides the EAGLE; formerly called the NCTA Teacher Portal)? For example, the Pennsylvania Standards Aligned System (SAS), Asia for Educators, Asia Society, Asia Education Foundation (AEF) and so on.

☐ Yes (please specify): _____

☐ No

Q15. How do you use educational portals? (Please rate the frequency of use)

	Never Always	Rarely	Sometimes	Most of time
Browsing resources, curricula, or images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Searching/retrieving resources, curricula, or images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Deriving resources, curricula, or images (e.g. downloading resources)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sharing resources, curricula, or images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communicating (blog using)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others (specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q16. How would you rate your own knowledge of East Asia?

☐ Poor ☐ Fair ☐ Good ☐ Very Good ☐ Excellent

Q17. How would you rate your own success in incorporating information about East Asia into your classes or curricula?

☐ Poor ☐ Fair ☐ Good ☐ Very Good ☐ Excellent

Q18. How do you incorporate information about East Asia into your classes or curricula? (250 words maximum)

Q19. How do you find resources for teaching about East Asia? (Please rate the frequency of use)

	Never time	Rarely Always	Sometimes	Most of
Ask a colleague	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
From the library	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Browsing/Searching digital libraries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Browsing/Searching online (e.g. "Google it")	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Browsing/Searching educational portals for teachers (specify: _____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Others (specify): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Q20. As a teacher, do you like to use an educational portal for teacher when you design teaching curricula? (choose one)
☐ Extremely Dislike ☐ Dislike ☐ Neither Like nor dislike ☐ Like ☐ Extremely Like
- Q21. As a teacher, do you feel comfortable to use an educational portal for teacher when you design teaching curricula? (choose one)
☐ Very uncomfortable ☐ Comfortable
☐ Uncomfortable ☐ Very comfortable
☐ Neutral
- Q22. As a teacher, do you use materials/resource from educational portal when you design curricula?(choose one)
☐ Don't use
☐ Want to use, but don't know how
☐ Use as reference to deliver extra information for curricula
☐ Do the best to integrate into any teaching process
☐ Other (specify): _____
- Q23. As a teacher, why would you use an educational portal to support your teaching preparation? (check all that apply)
☐ To develop curriculum
☐ To extend existing curriculum
☐ To review others teachers' curriculum as a teaching reference
☐ To develop an assignment
☐ To find/ borrow an assignment
☐ To look up new information
☐ To enhance and enrich the teaching-learning process
☐ To present more ideas about subjects/ topics to other teachers (e.g. to contribute to blog)
Other (specify) _____
- Q24. "As a teacher, what would prevent you from using educational portals (relating to interface access, time-consumption, and user support) to support your teaching preparation?" (Check all that apply)
☐ Not easy to use
☐ Lacks esthetic design
☐ Not well-organized
☐ Lacks accessibility/ availability
☐ Lacks adequate support (online lesson or tutorial)
☐ No training or workshops on how to access the portal (face-to-face lesson)
☐ System doesn't always provide useful resources (No relevant information provided)
☐ Time-consuming (takes too much time to learn the system)

- ☐ N/A
- ☐ Other (specify) _____

Q25. As a teacher, what would make you feel unwilling to use resources from educational portals to support your teaching preparation? (Check all that apply)

- ☐ Don't know how to incorporate resources into your own curriculum
- ☐ Time-consuming (need extra time to prepare a curriculum if using resources)
- ☐ Don't think the resources can match existing lesson/ curriculum
- ☐ Don't believe the existing resources can enhance and enrich the teaching process
- ☐ Difficulty in reshaping the existing lesson plans for the curriculum
- ☐ Colleague influence
- ☐ Reputation of the portal is not good
- ☐ Lack Confidence in the content of educational portal
- ☐ Other (specify) _____
- ☐ N/A

APPENDIX B. ACCEPTANCE QUESTIONNAIRE

EXAMINING K-12 TEACHERS' ACCEPTANCE WHEN SEEKING MATERIALS IN EDUCATIONAL PORTALS

"Educational portals can be utilized in two ways as a supportive tool during preparation, either to retrieve information or to share knowledge and information"(Pynoo, Tondeur, van Braak, Duyck, et al., 2012). The National Consortium for Teaching about *East Asia Gateway for Linking Educators* (EAGLE; <http://noborders.ucis.pitt.edu/eagle/>) (formerly: the NCTA Teacher Portal) is designed to help K-12 teachers incorporate East Asia into their classrooms. The purpose of this survey is to examine what kind of interface features may influence K-12 teachers' acceptance of educational portals via teachers' perceived usefulness and perceived ease of use. Your answers to the following questions will help us to understand teachers' information usage and needs as well as enhance the EAGLE portal. Thank you very much.

Part I. Questions 1 to 12 are related to Background and Prior Technology Experience

Q1. Gender : ☐ Male ☐ Female

Q2. Age: ☐ ≤ 29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 +

Q3. Highest Degree Earned:

☐ BA ☐ BS ☐ BBA ☐ MA ☐ Med ☐ MS ☐ Ph.D. ☐ Others (specify): _____

Q4. How many years have you been a teacher (years of teaching experience)?

☐ 1-5 ☐ 6-9 ☐ 10-14 ☐ 15-24 ☐ 25 +

Q5. Current Grade(s) taught: (If you are retired, please check the level(s) you used to teach)

☐ PK- 4 ☐ 5-8 ☐ 9-12 ☐ College

Q6. Current Subject(s) taught (Check all that apply):

☐ Art ☐ Language Arts ☐ Social Studies ☐ History/Culture ☐ Global Studies ☐ Geography
-Foreign Language: ☐ Chinese ☐ Japanese ☐ French ☐ German ☐ Spanish
☐ ESL ☐ Music ☐ Library ☐ Math ☐ Special education ☐ Gifted
☐ General Science (e.g. Physics, Biology, and Chemistry)
☐ Other (specify) _____

Q7. Do you have access to high speed/FIOS internet at home or school?

☐ Yes

☐ No

Q8. How would you rate your own ability to address various computer issues e.g. downloading/ uploading to internet, install programs/plugin-ins?

☐ Very dissatisfied ☐ Dissatisfied ☐ Neutral ☐ Satisfied ☐ Very satisfied

Q9. How often do you use online search engines (e.g. Google, Bing, etc...) to find teaching resources to support your curriculum/teaching design?

- ☐ **Never** ☐ **Less than once a week** ☐ **A few times per week** ☐ **At least once per day**
☐ **Many times per day**

Q10. Please list the advantages of using online search engines to support your teaching.

Ans:

Q11. How often do you use an educational portal for teachers to find teaching resources to support your curriculum/teaching design?

- ☐ **Never** ☐ **Less than once a week** ☐ **A few times per week** ☐ **At least once per day**
☐ **Many times per day**

Q12. Please list the benefits of using educational portals for teachers to support your teaching.

Ans:

Part II: Questions 13 to 14 are related to Perceived Usefulness and Perceived Ease of Use

Q13. As a teacher, do you have experience with any of the following situations in regards to the usefulness of educational portals for teachers with teaching/curricula design?

(1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strong Agree)

I found that using educational portals for teachers:

		Strong Disagree	←	→	Strong Agree
1.	always addresses my teaching-related needs	1	2	3	4
2.	has supported critical aspects of my teaching	1	2	3	4
3.	has enabled me to accomplish curriculum design more quickly	1	2	3	4
4.	has improved my teaching performance (teaching quality)	1	2	3	4
5.	has enhanced my effectiveness with teaching	1	2	3	4
6.	has increased my teaching productivity	1	2	3	4
7.	has made it easier to conduct my teaching	1	2	3	4
8.	overall is useful in my teaching	1	2	3	4

☐ **Other comments:** _____

Q14. As a teacher, have you had the following experiences in using educational portals for teachers?

I found that:

		Strongly Disagree	←	→	Strongly Agree
1.	Learning to use educational portals for teachers is easy	1	2	3	4
2.	It's easy to recover from errors encountered while using educational portals for teachers	1	2	3	4
3.	Interacting with an educational portal for teachers does not require much effort (I don't become frustrated)	1	2	3	4
4.	It is easy of most educational portals for teachers	1	2	3	4
5.	Overall, most educational portals for teachers are easy to use	1	2	3	4

☐ **Other comments:** _____

Part III: Questions relate to interface and content quality in the Educational Portals

- Questions 15 to 17 are specific to ask question about EAGLE (formerly: the NCTA Teacher Portal). Please take at least 5 minutes to browse the portal:

<http://noborders.ucis.pitt.edu/eagle/>

Q15. How often do you **visit** the EAGLE /NCTA teacher portal?

- ☐ This is my first time ☐ once per semester ☐ once a month ☐ once a week
☐ once a day

Q16. As a teacher, how important are (or would be) the following reasons for you to use the EAGLE site?
(1=Unimportant; 2=Low importance; 3=Slightly important; 4= Importance)

		Unimportant ←---→ Important
1.	To develop/extend teaching materials or assignments for students (Lesson Plans)	1 2 3 4
2.	To look at other teachers' lesson plans for ideas	1 2 3 4
3.	To reference materials about East Asia	1 2 3 4
4.	To download files (documents)	1 2 3 4
5.	To download images (photos)	1 2 3 4
6.	To complete seminar assignments	1 2 3 4
7.	To contribute materials about subjects/topics to other teachers (e.g. files or images)	1 2 3 4
8.	To reference/read blogs	1 2 3 4
9.	To see "What's New" in the teaching material database	1 2 3 4

☐ Others (specific): _____

Q17. What is your **main reason** for visiting the EAGLE /NCTA teacher portal? Or, if you have used the EAGLE teacher portal before, what was your **main reason** for visiting the site?

Ans:

Q18. As a teacher, **how frequently** do you use the EAGLE for these purposes?

(1=Never; 2= Occasionally; 3= Often; 4=Always)

		Never ←--→ Always
1.	Browsing resources (including files/documents)	1 2 3 4
2.	Browsing images (photos only)	1 2 3 4
3.	Searching specific resources (including files/documents)	1 2 3 4
4.	Searching specific images (photos only)	1 2 3 4
5.	Downloading resources (including files/documents)	1 2 3 4
6.	Downloading images (photos)	1 2 3 4
7.	Contributing materials (e.g. uploading my own files or images)	1 2 3 4
8.	Browsing/reading the study tour blogs	1 2 3 4

☐ Others (specific) : _____

- Questions 19 to 22 refer to the interface design of the EAGLE. Please refer to <http://noborders.ucis.pitt.edu/eagle/>

Q19. Please rate your **satisfaction** with following criteria about the EAGLE and provide a reason for your rating. (1= Very Dissatisfied; 2=Dissatisfied; 3=Satisfied; 4=Very Satisfied)

		Very Dissatisfied	←-→	Very Satisfied	Please list the reason for your selection
1	Navigation	1	2	3	4
2	Accuracy of information	1	2	3	4
3	Relevance of Information	1	2	3	4
4	Visual appeal	1	2	3	4
5	Web Readability	1	2	3	4
6	Web organization	1	2	3	4
7	The layout of the “Teaching Materials Database”	1	2	3	4
8	The layout of the “Photo Gallery”	1	2	3	4
9	Time it takes to find teaching materials in the Teaching Materials Database	1	2	3	4
10	Time it takes to find images/photos	1	2	3	4

☐ **Others (specific):** _____

Q20. Please rate the **usefulness** of the following features on the EAGLE when you are searching for resources to support your teaching or curricula design and provide a reason why. (1=Strongly Disagree; 2=Disagree;3=Agree;4=Strong Agree)

Questions	Strong Disagree ← → Strong Agree	Please list the reasons for your selection
• Teaching Materials Database:		
1. Teaching Materials Database- Keyword Search	1 2 3 4	
2. Teaching Materials Database –Type of Publication search filter	1 2 3 4	
3. Teaching Materials Database - Minimum Average Rating search filter	1 2 3 4	
4. Teaching Materials Database – Region search filter	1 2 3 4	
5. Teaching Materials Database –Subject search filter	1 2 3 4	
6. Teaching Materials Database -Time Period search filter	1 2 3 4	
• Contributed materials		
7. Contributed materials Keyword Search	1 2 3 4	
• Photo Gallery		
8. Browsing the Photo Gallery	1 2 3 4	
9. Photo Gallery – Category search filter	1 2 3 4	
10. Photo Gallery - Region/Country search filter	1 2 3 4	

11. Tour Blogs	1 2 3 4	
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Q21. Please rate the **Ease of use** of these features on the EAGLE when you are searching resources to support your teaching or curricula design and please also provide a reason for your rating.
(1=Very Difficult;2=Difficult;3=Easy;4=Very Easy)

	Very Difficult ←---→ Very Ease to Use	Please list the reason for your selection
1. Main Page design	1 2 3 4	
2. Keyword Search in the Teaching Materials Database & the Contributed materials	1 2 3 4	
3. The category search for the Teaching Materials Database	1 2 3 4	
4. Category and Region/Country Search in the Photo Gallery	1 2 3 4	
5. Tour Blogs navigational bar	1 2 3 4	

Q22. If you could identify at least **one improvement to the EAGLE** what would that be and why?
Ans: (Suggestions)

- **Questions 23 and 24** refer to other existing educational portals; please take at least 5 minutes to browse/search the following 4 portals with 16 items :
 - Asia for Educators (<http://afe.easia.columbia.edu/>)
 - American Memory (<http://memory.loc.gov/ammem/index.html>)
 - The Pennsylvania Standards Aligned System (<http://www.pdesas.org/module/content/search/>)
 - History World (<http://www.historyworld.net/>)

Q23. As a teacher, please rate how **important** the following features are for an educational portal for teachers and provide a reason **why**. (1=Unimportant; 2=Low importance; 3=Slightly important; 4=Important)

Questions	Unimportant ←→ Important	Please list the reason for your selection
• Asia For Educators (http://afe.easia.columbia.edu/)		
1.- Search bar (on main page)	1 2 3 4	
2- Image Categories (subjects) provided	1 2 3 4	
3- Search by Time Period	1 2 3 4	
4- Timelines & Resources	1 2 3 4	
5- Teaching modules	1 2 3 4	
6- Literature Across the Curriculum by grades (under "Language Arts" category)	1 2 3 4	
7-Links to Related Resources (at the bottom of the main page)	1 2 3 4	

Other features (please specify)	1 2 3 4	
• American Memory (http://memory.loc.gov/ammem/index.html)		
8- Navigation bar (top of main page)	1 2 3 4	
9- Browse collection by Topics	1 2 3 4	
10- More browsing options (under “Browse collection”)	1 2 3 4	
11- Collection Highlight	1 2 3 4	
12- Today in History	1 2 3 4	
Others features (please specify)	1 2 3 4	
• The Pennsylvania Standards Aligned System (http://www.pdesas.org/module/content/search/)		
13- Navigation bar (on main page)	1 2 3 4	
14- Search by Grade level(s) (under “Curriculum Framework”)	1 2 3 4	
15- Teaching Frameworks (under “Instruction”)	1 2 3 4	
Others features (specific)	1 2 3 4	
History World (http://www.historyworld.net/)		
16- Tag Cloud (right side of main page)	1 2 3 4	
Others features (specific)	1 2 3 4	

Q24. Please list features (can include above features) that are crucial for an educational portal for teachers in helping you to search/share materials in the portal and why?

Ans:

APPENDIX C. ACCEPTANCE INTERVIEW

EXAMINING K-12 TEACHERS' ACCEPTANCE WHEN SEEKING MATERIALS IN EDUCATIONAL PORTALS

Your participation will help us to understand your usage and needs as a teacher in using an educational portal as well as serve to enhance our EAGLE portal. Please read the details about the interview as follows.

1. The interview survey will take you about 45-60 minutes to finish.
 2. We will record your answer for academic research purpose only and all responses are confidential.
 3. There are four parts including **12 Questions** during the interview
- **Part I:** Background and prior technology experience
 - **Part II:** Questions about using general educational portals to seek information that supports your teaching
 - **Part III:** The usage and improvement of EAGLE (<http://noborders.ucis.pitt.edu/eagle/>). If you need, you can ask the interviewer to give you 10 minutes to review EAGLE.
 - ❖ **If you have any considerations, please speak up before we start the interview. Thanks!**
 - ❖ URL for Demographic: http://katz.qualtrics.com/SE/?SID=SV_d50aaVPMN1a6RE1

Part I. Background and Prior Technology Experience

Q1. Gender : ☐ Male ☐ Female

Q2. Age: ☐ ≤ 29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 +

Q3. Highest Degree Earned:

☐ BA ☐ BS ☐ BBA ☐ MA ☐ Med ☐ MS ☐ Ph.D. ☐ Others (specify): _____

Q4. How many years have you been a teacher (years of teaching experience)?

☐ 1-5 ☐ 6-9 ☐ 10-14 ☐ 15-24 ☐ 25 +

Q5. Current Grade(s) taught: (If you are retired, please check the level(s) you used to teach)

☐ PK- 4 ☐ 5-8 ☐ 9-12 ☐ College

Q6. Current Subject(s) taught (Check all that apply):

☐ Art ☐ Language Arts ☐ Social Studies ☐ History/Culture ☐ Global Studies ☐ Geography

-Foreign Language: ☐ Chinese ☐ Japanese ☐ French ☐ German ☐ Spanish

☐ ESL ☐ Music ☐ Library ☐ Math ☐ Special Education ☐ Gifted ☐ General Science (e.g. Physics, Biology, and Chemistry) ☐ Other (specify) _____

Part II. About Using General Educational Portals to Seek Information (Q7-Q9 relate to the questions of using educational portals into your teaching preparation and curriculum design)

- Q7. What are the major reasons that you use (or not use) educational portals? and Why?** (In the online questionnaires, many of you mentioned that the benefits of using educational portals are the availability to reliable contents specifically-tailored to particular/useful subject matter. However, most of you use educational portals less than once a week. As a teacher, could you please tell me what are the major reasons (considerations) to use (or not use) an educational portal?)
- Q8. What are user-friendly aspects of an educational portal for teachers when you're searching resources from an educational portal to support your lesson preparation and curricula design?**
- Q9. As a teacher, what kind of educational portals can be called well-organized design when you searching materials to support your lesson preparation and curricula design? Or could you please give me an example of the well-organized educational portals?**

C.3 Part III: Q10-Q11, please tell us what you think about the EAGLE overall.

- Q10. What are the major reasons (considerations) that you use (or not use) EAGLE?** (In the online questionnaires, most of you indicate that you are satisfaction with EAGLE design and performance (e.g. satisfied navigation, web organization, and features provided – teaching materials database, and photo gallery). However, most of you use EAGLE once per semester to teach East Asia content in the classroom. Could you please tell me why you incorporate EAGLE once per semester into your teaching?)
- Q11. As a teacher, would you consider EAGLE to be a useful portal for you to seek information to support your teaching, and why? If no, why is it not useful for you?**
- Q12. As a teacher, would you consider EAGLE to be a user-friendly and well-organized portal to find resources for your teaching, and why? If no, then how is it not user-friendly and well-organized?**

Thank you very much for your help

APPENDIX D. SELF-EFFICACY INTERVIEW

EXAMINING K-12 TEACHERS' COMPUTER SELF-EFFICACY (TCS)

“Teachers integrate technology in different ways” (p164) and their beliefs affect their computer use (Teo et al., 2008). This interview focuses on understanding whether teachers’ beliefs/confidence in their capabilities when performing computer tasks and whether these beliefs/confidence affect their acceptance when using educational portals. As a participant, please tell me how you feel/think about your computer and Internet capabilities. Also, please tell me whether you believe or are confident in dealing with difficult and different computer technology such as hardware, software, and Internet issues.

In addition, there is a total of **11 Questions** in this interview that lasts around 60 minutes. Your answers will be recorded for academic research purpose only and all responses are confidential.

Interview Questions

Q1-Q3: when you use a **computer (hardware/software)** to prepare your lessons, please tell me whether you **(Q1) Enjoy, (Q2) Feel Comfortable, and (Q3) Have Self-confidence using computer to perform tasks**. Please give me examples for each situation, clarifying how and why.

Q4-Q6: when you **seek information resources** from educational portals to prepare your lessons, please tell me whether you **(Q4) Enjoy, (Q5) Feel comfortable, and (Q6) Have self-confidence seeking for information**. Please give me examples for each situation, clarifying how and why you have used educational portals.

Q7: Please tell me whether you feel confident **incorporating and reshaping resources from educational portals into your own curriculum?** Please give me examples and tell me how you incorporated/reshaped them and why or why not.

Q8: Please tell me whether you feel confident **addressing various computer issues (Q8_1)** when using educational portals? Please give me examples when you felt confident to address various computer issues, how, and why or why not. **How do you deal with unexpected issues (Q8_2)?**

Q9: Please tell me whether you feel confident **dealing with different (Q9_1) and difficult (Q9_2) functions/features when you search for information in educational portals**. Please give me examples of when you felt confident in dealing with different functions or features, how you dealt with them, and why you made that choice.

Q10: Please tell me whether you feel confident when **using a new educational portal**? Please give me examples when you felt confident using a new educational portal, how you used it, and why?

Q11: Please tell me if you do not find resources from educational portals, would you keep trying to use portals until you find the resources? Or what do you do? Why did you make this choice?

Thank you ☺

APPENDIX E & APPENDIX F

Appendix E and Appendix F: Transcripts of the Acceptance are available from the author (ilc5@pitt.edu) upon request

APPENDIX G. IRB APPROVAL LETTER



University of Pittsburgh *Institutional Review Board*

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
<http://www.irb.pitt.edu>

Memorandum

To: Cheng I-Ling
From: Sue Beers , Vice Chair
Date: 10/11/2012
IRB#: [PRO12100120](#)
Subject: Interactive Search Interface for Teacher Information-Seeking Behaviors

The above-referenced protocol has been reviewed by the University of Pittsburgh Institutional Review Board. Based on the information provided, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(2).

Please note the following information:

- If any modifications are made to this project, use the "**Send Comments to IRB Staff**" process from the project workspace to request a review to ensure it continues to meet the determination.
- Upon completion of your project, be sure to finalize the project by submitting a "**Study Completed**" report from the project workspace.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

APPENDIX H. CODING SCHEME FOR CONTENT ANALYSIS

Category	Subcategory	Definition and explanation
Teachers' Acceptance	1) Perceived usefulness	Teachers' perception of efficiency and effectiveness (e.g. whether the portals would make teachers' works more quickly and /or improve their task performance).
	2) Perceived ease to use	Teachers' perception of system (whether teachers felt that the portal is ease to use /access , flexible to learn and/or interactive)
Time issues	1) Time consuming	Teachers feel it is time consuming to find/search information through portals
	2) Time Constraints	Teachers have time constraints when preparing materials if using information form portals
Social Influence	1) Subjective norm (SN)	What actions people who are important to teachers think should (or should not) be performed (e.g. Principle/Colleagues/Students)
	2) Curriculum setting	Teachers have to follow the school/state curriculum set to arrange the subjects/units
	3) school technology support	Teachers agree (disagree) that school provided enough technology support
System Interface	1) Quantity of information presented	The system should display information with organized techniques (e.g. visual design, information customization and personalization).
	2) Grouping/ highlighting information	The system should provide readability and to avoid clutter and confusion design (e.g. to group similar information, to highlight relationships between different groups of resources).

	3) Screen standardization	The system should have a consistent and effective format across the portals (to reduce time or facilitate teachers to access the information)
	4) Multimedia elements Usage	The system should provide “multimedia features” (e.g. pictures, diagrams, video, and sound) in order to help teachers process textual information.
	5) Navigability	The system provides intuitive and easy to use navigation support (e.g. menu navigation and search facilitation)
	6) Explanation	The system should provide a detailed overview, learning aims and outcomes that simply explain topics covered and content included
	7) Communication channel	The system should provide tools to facilitate teacher communication (e.g. twitter, email and chat channels or see others teachers activities)
	8) Feedback (notification)	The system should notify teachers of portal updates.
Content Quality	1) Relevant content/resource	Whether system provides various relevant resources e.g. Books, Journal articles, CDs, DVDs, images, and/or others relevant documents
	2) Content sharing capabilities	Whether system provides the capabilities for teachers to share their experiences of using content from portals in their classrooms
	3) Content organization	Whether system integrates high quality content/ or distinguishes high quality information from possibly mere subjective opinions
Teachers’ Computer Self-Efficacy (TCS)	1) Mastery experience	a person’s previous success and/or failure experiences
	2) Vicarious experience	a person observation of others’ successes and/or failures
	3) Verbal persuasion/Social persuasion	a person has been persuaded by peers, colleagues, or others
	1) Affective arousal/Emotional state	a person’s emotional states such as anxiety, stress, arousal, and mood states

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